THE IRON TRADE REVIEW

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Pittsburgh Iron & Steel Foundries Co.

MIDLAND, PA. PITTSBURGH, PA.

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THE IRON TRADE REVIEW

Vol. LVIII Cleveland, February 17, 1916 No. 7

Begging Mills to Take Plate Orders

Railroads and Ship Builders Would Like to Place Large Tonnages—Corporation Bookings in Excess of Those for January

THE remarkable change in a few months in the attitude of mills toward railroads is shown by the fact that from 50,000 to 100,000 tons of steel, largely plates, have been pending for more than a week in eastern territory and railroads are still unable to place their tonnages. Ship building concerns are in a similar position, and on account of the large number of orders which they have on hand and inability to obtain steel, are declining to take on additional contracts for vessels.

Pig Iron

Although there has been buying in the central west in a quiet way and some increase in activity in the south, the volume of pig iron transactions is not large. In some sections, notably in the Pittsburgh district, dullness is attributed to congested traffic conditions and embargoes against the export of material, and strikes which have tied up some plants, causing a reduction in the consumption of iron. Shortage of gas in many plants in western Pennsylvania, Ohio and West Virginia has reduced production of finished materials. Blast furnaces are being driven as seldom before in their history.

Price Advances

The prices of wire products have again been moved up $2, making the highest quotation in 15 years. Other advances are: Spikes, $2; chain, $10; strip steel, $5; rivets, $2; sheet piling, $5, and black and galvanized pipe, $2. Warehouse prices have also been advanced, but in spite of the numerous advances which have been made, quotations from store, notably on plates, are frequently lower than mill prices for prompt delivery.

Railroad Buying

A very heavy inquiry for locomotives is pending, but builders are at a loss to know how they will obtain steel to meet their prospective requirements. The Southern Pacific has awarded 3,500 cars to two builders and is in the market for about 1,200 cars. The Bessemer & Lake Erie will soon place about 2,500 cars. Inquiries for about 100,000 tons of rails for export to Russia, France and Italy are now receiving attention.

Structural Material

Lettings of structural contracts aggregated the smallest tonnage in January of any month since September, being only 69 per cent of capacity of shops. It is believed that structural mills are turning out large tonnages of rounds for the manufacture of munitions and consequently are not so anxious to take contracts for shapes.

Iron Ore

A contract for a block of 40,000 tons of iron ore to be shipped from Escanaba to lower lake ports has been made at 25 cents over the regular contract price and some ore shippers are endeavoring to contract for shipment from the head of the lakes at higher prices. It is not expected, however, that there will be much contracting at rates higher than those generally prevailing. Some sales of Superior ore are being made, principally to eastern furnaces.

Ferro Manganese

The ferro-manganese situation continues to cause anxiety among steel manufacturers. The advance of $25 per ton, to $150 on contract, did not cause any cessation in buying, and for prompt delivery, quotations range from $225 to $250. Spiegeleisen is also selling at high quotations.

Selling Policy

The policy of leading companies is to avoid contracting as much as possible, except in giving protection against specific jobs. For anything approaching prompt delivery, high premiums are being paid to some companies, and on ordinary contracts it is almost impossible to obtain promise of delivery before the fourth quarter. The Steel Corporation's bookings at present are understood to be running at about 20,000 tons daily over shipments, as February buying is far ahead of that for January. Pressure for deliveries is very strong and many plants are experiencing trouble in keeping in full operation owing to shortage in materials.

THE OPEN HEARTH

Iron Ore in Furnace Yards

THE iron and steel industry of the country owes its capacity for expansion, in a large measure, to the flexibility of the ore mining and ore transportation agencies. The renovation of a long idle blast furnace plant or steel mill, under the most favorable circumstances, entails a wait of several months, with a heavy attendant burden of expense. But the mine superintendent can increase the output of his properties from the minimum to the maximum on comparatively short notice. Only the largest and most economical bulk freighters may be plying the Great Lakes one month, but an increase in the tonnage offered will bring quickly from its moorings the remainder of the great fleet that forms such a vital link in making available the rich iron ore deposits of Michigan and Minnesota.

To this ability to obtain large quantities of ore when needed, the iron and steel industry owes, to a large extent, its assured prospects for maximum operations during 1916. One cannot go far astray in ranking this quickly obtainable ore supply alongside the avalanche of orders, in importance. Orders are useless without ore supplies, and ore mining operations are governed by the volume of orders received.

Last summer, when the irresistible momentum of the present buying movement began to be realized, the fear was commonly expressed that a shortage of ore would occur before the Great Lakes fleet was released from its ice-bound anchorages in the spring of 1916. Now with the resumption of navigation still several months away, this ore famine has proved an idle fantasy. We were spared through the promptness with which the mines and vessels rallied to the occasion in the closing months of the season. Sporadic ore shortages are found, principally, where idle furnaces, without mining or vessel connections, were unable to secure the supplies for resumption.

The mines not only forwarded enough ore to satisfy the enormous demands made by the blast furnaces during the closing months of 1915, but they actually increased the available supplies on lower lake docks and in blast furnace yards. A conservative estimate shows that these stocks on Jan. 1, 1916, were about 460,000 tons greater than at the opening of 1915. This increase was affected in the face of the enormous gain in pig iron production shown during the last half of 1915, when approximately 17,525,000 tons were produced, against 10,600,000 tons in the last half of 1914.

The estimated production of pig iron during 1915, excluding spiegel, ferro and charcoal iron, was 29,300,000 tons, comprising about 7,415,000 tons of merchant iron and 21,885,000 tons of non-merchant iron. This compares with 22,740,000, 6,510,000 and 16,230,000 tons, respectively, in 1914. The percentage of merchant iron produced by furnaces using lake ores, as shown by the pig iron production returns furnished *The Iron Trade Review*, varies from 59 to 60 per cent. Thus the merchant iron produced from Lake Superior ores in 1915 and 1914 was approximately 4,440,000 and 3,860,000 tons, respectively. The percentage of non-merchant iron produced from Lake Superior ores is about 89 per cent, so that the corresponding figures for the two years are 19,560,000 and 14,400,000 tons, respectively. The total production of pig iron from Lake Superior ores was, therefore, 24,000,000 tons in 1915 and 18,260,000 tons in 1914, or about 81 per cent of the total output of the country. On the basis of 1.85 tons of ore to each ton of pig iron, the Lake Superior ore consumed in producing merchant iron in 1915 and 1914 was approximately 8,200,000 and 7,150,000 tons, respectively; for non-merchant iron, 36,200,000 and 26,650,000; the total, therefore, being 44,400,000 and 33,800,000 tons. Lake ore shipments to eastern furnaces were between 450,000 and 500,000 tons in 1914, and about 1,250,000 tons in 1915. Canadian furnaces consumed about 475,000 tons in 1914 and 750,000 tons in 1915. The charcoal furnaces took 375,000 tons in 1914 and 400,000 tons last year. The total lake ore consumed in 1915, therefore, was 46,800,000 tons, compared with 35,125,000 tons in 1914. The shipments by lake last year were 46,359,268 tons, and in 1914 were 31,916,162 tons. Adding to this the all rail movement, which was about 900,000 tons last year, against 707,829 tons in 1914, gives total shipments of Lake Superior ore for the two years of 47,259,268 and 32,623,991 tons. In 1914, the consumption exceeded shipments by 2,500,000 tons, but in 1915 the furnaces consumed 460,000 tons less than was shipped.

The Lake Superior mines and ore-carrying fleet, therefore, during the last months of the 1915 navigation season, forwarded enough ore to increase stocks in furnace yards and on lower lake docks by about 460,000 tons. The ore on dock Jan. 1, 1916, was 7,950,000 tons, against 8,050,000 tons Jan. 1, 1915, a decrease of 100,000 tons. The supplies of ore in furnace yards, therefore, at the beginning of 1916 were 560,000 tons greater than on Jan. 1, 1915.

Ore is being forwarded more freely from lower lake docks to interior furnaces, than during previous years, the January, 1916, shipments being 887,426 tons, against only 249,123 tons in January, 1915. The balance on dock Feb. 1, 1916, was 7,071,275 tons, compared with 7,802,806 tons on Feb. 1, 1915. A continuance of these heavy shipments will reduce the amount of ore on dock May 1, to about 3,900,000

THE OPEN HEARTH

tons. This figure, while 2,190,000 tons less than the dock balance May 1, 1915, is well above the tonnages held by the docks in years prior to 1908. Furnace managers, therefore, have ample justification for concentrating their entire attention upon production.

What of Industrial Defense?

THE resignation of Secretary of War Lindley M. Garrison may well be looked upon with grave concern as to the possible effect it may have on plans proposed for industrial defense. Easily one of the strongest and most practical men in the Wilson cabinet, Mr. Garrison had constructive ideas relating to the mobilization of those agencies which would be a great factor in placing a nation in a position to defend itself. He was working zealously to have those ideas crystalized and enacted into law, and his department has drafted one measure ready for presentation to congress which would aid private plants to maintain themselves in readiness to produce war material on short notice in time of need. These plants would be encouraged also to continue in business through a liberalization of appropriation measures by which moderate contracts would be given to the plants regularly by the government. As the situation exists under present laws, the amount of business given these plants by the government for war department supplies is negligible. It remains to be seen what chance there may be for congress to favor such liberalized appropriations now that the strong influence of Mr. Garrison is missing. The measure at its best was considered to have small enough opportunity for favorable consideration because of the professional politicians in congress who capitalize the demagogic sentiment relating to "private profit from war".

It is sincerely hoped that Mr. Garrison's sensible and earnest stand toward industrial defense will be taken up by his successor, but in view of the recent trend of events, there is considerable misgiving for fear such a policy will not be pursued. It required fearlessness, strange as it may seem, and there have been relatively few men in public life who were possessed of the courage exhibited by Mr. Garrison.

The policy of Secretary of the Navy Daniels with regard to industrial defense is opposite to that advocated by Mr. Garrison. The former is obsessed with the idea of government manufacture of war material upon such a scale as to be alarming, despite his protestations that he wants to encourage private industry. His socialistic schemes do not square with his assertions.

The chamber of commerce of the United States, at its convention last week in Washington, went on record in a way that shows it is trying to bring about co-oporation between the industrial, agricultural and transportation forces of the nation on the one hand and the government on the other, so as to insure a scientific system of co-ordination in the event of a supreme crisis. This effort, coming from the business men from all parts of the country, should meet with the immediate sympathy and support of congress, but if it does, it will require insistent and difficult work, according to present signs.

Mere gathering of statistics showing the output of plants making munitions and similar data, to be furnished to the navy and war and other government departments, is only a physical fundamental. The matter of seeing that these plants are placed at the disposal of the government in times of emergency calls for legislative encouragement and should be given heartily.

An Important Industry

AN EVENT of much importance to consumers of tin in this country, and particularly to the makers of tin plate, is the establishment of the tin refinery at Perth Amboy, N. J., by the American Smelting & Refining Co. This plant, which began operating on Feb. 1, is to produce about 10,000 tons of tin annually, or approximately one-fifth of this country's requirements. The feature of greatest interest is that, by employing a new process of electrolytic refining, this plant will produce from Bolivian and other impure ores a grade of tin fully the equal of Straits tin in quality. The significance of this statement is apparent when it is recalled that because of the exacting requirements of the tin plate industry, approximately 80 to 90 per cent of the tin imported is brought here from the Straits Settlements. Tin produced by the American Smelting & Refining Co.'s process already has been tried out with uniform success by tin plate makers, who have found it to be of the requisite purity. Tin made from Bolivian ores by the old-fashioned smelting process employed in England for the past 300 or 400 years always has ranked below Straits tin in quality. Thus the new refinery at Perth Amboy not only inaugurates a new industry in this country, but greatly enlarges the available supply of high-grade tin. That tin prices will continue to be controlled from London, however, seems likely, in view of England's control of Straits tin, and of the fact that the American producer will be forced to buy its ore in Bolivia in competition with British and German buyers after the war is terminated.

Prices Present and Past

Quotations on leading products February 16, average for January, 1916, average for November, 1915, and average for February, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Feb. 16, 1916.	Aver. for Jan., 1916.	Average for Nov., 1915.	Aver. for Feb., 1915.
Bessemer pig iron, Pittsburgh..	$21.45	$21.32	$17.45	$14.63
Basic pig iron, Pittsburgh.....	18.70	19.20	16.70	13.45
No. 2 Fdy. pig iron, Pittsburgh	19.45	19.95	16.45	13.95
Northern No. 2 Fdy., Chgo....	18.50	18.50	17.12	13.00
Lake Superior Charcoal, Chgo..	19.75	19.25	17.50	15.75
Mall., Bess., Chgo.....	19.00	19.00	17.12	13.00
Southern No. 2, Birmingham...	14.50	14.13	11.75	9.50
Southern Ohio No. 2, Ironton..	18.00	17.00	14.88	12.75
Basic, eastern Pa.....	19.50	19.50	17.75	13.75
No. 2X Virginia furnace.....	18.00	17.50	15.50	12.50
No. 2X foundry, Philadelphia...	20.00	19.75	17.50	14.25
Ferro mang., Balti., (forward)..	150.00	125.00	100.00	100.00
Bessemer billets, Pbgh.....	34.00	33.75	27.75	19.50
Bess. sheet bars, Pbgh.....	34.00	33.75	28.25	20.00
Op.-h'th sh. bars, Pbgh.....	35.00	34.75	28.50	20.00
Open-hearth billets, Pbgh.....	35.00	34.75	28.00	19.50
Steel bars, Chgo.....	2.39	2.03	1.79	1.31
Steel bars, Pittsburgh.....	2.00	1.865	1.625	1.10
Iron bars, Philadelphia.....	2.259	2.259	1.759	1.15
Iron bars, Cleveland, local del'y.	2.25	2.00	1.50	1.15

	Prices Feb. 16, 1916.	Aver. for Jan., 1916.	Average for Nov., 1915.	Aver. for Feb., 1915.
Iron bars, Chgo. mill.....	$1.90	$1.83	$1.48	$1.04
Beams, Chgo.	2.39	2.03	1.79	1.31
Beams, Pittsburgh	2.00	1.865	1.625	1.10
Beams, Philadelphia	2.159	2.159	1.959	1.25
Tank plates, Pittsburgh.....	2.10	1.875	1.625	1.10
Tank plates, Chicago.....	2.44	2.05	1.79	1.27
Tank plates, Philadelphia.....	2.659	2.409	1.959	1.25
Sheets, blk., No. 28, Pbgh.....	2.60	2.58	2.22	1.80
Sheets, blue an., No. 10, Pbgh.	2.60	2.45	1.80	1.30
Sh., galv., No. 28, Pbgh.....	4.75	4.75	3.90	3.01
Wire nails, Pittsburgh.....	2.30	2.125	1.87	1.55
Connellsville fur. coke, contr...	2.50	2.38	2.35	1.65
Connellsville fdy. coke, contr...	3.50	3.00	2.96	2.25
Heavy melting steel, Pbgh.....	17.50	17.50	15.31	11.62
Heavy melting steel, east'n Pa..	16.50	17.00	14.50	10.50
Heavy melting steel, Chgo.....	15.00	15.50	13.13	9.44
No. 1 wrought eastern Pa.....	22.50	22.50	17.00	12.00
No. 1 wrought, Chgo.....	14.75	15.50	12.75	8.88
Rerolling rails, Chgo.....	17.00	17.68	14.31	9.62
Car wheels, Chgo.....	13.75	14.75	12.73	10.00

(For Additional Prices See Page 410.)

Pig Iron Market Dull But Firm

Inquiry for Low Phosphorus in the East—Lifting of Embargoes by Some Railroads Brings Relief

Philadelphia, Feb. 14.—Considerable inquiry for low phosphorus pig iron for last half now is coming out from buyers who previously had covered for the first six months. There has been some selling for the last half at unchanged prices or at $32, Philadelphia basis, for standard iron, and at $29 to $30, furnace, for Lebanon grades. Apart from this business, the week has been bare of important developments in this territory. There is talk that the Lukens Iron & Steel Co., which recently distributed 77,500 tons of forward basic, may further increase this purchase by giving additional tonnage to several of the makers, but nothing of this nature yet has been put through. A new Pottstown, Pa., plate maker has inquired for 1,500 tons of first and second quarter basic. Basic remains at $19.50 to $19.75, delivered eastern Pennsylvania. There was an appearance of more irregularity in eastern Pennsylvania foundry grades the past week and some quotations of $19, furnace, or approximately $19.80, Philadelphia, for No. 2X were made. The market has not been visibly affected, however. The Pennsylvania railroad closed this week for 2,300 tons of several foundry grades additional for second quarter delivery at Altoona. A Delaware river pipe maker took about 3,000 tons additional of eastern Pennsylvania pipe forge at approximately $18.60, delivered. Further lots of resale Virginia iron have been disposed of around $17.50, furnace, for No. 2X, or under the $18 schedule of the largest Virginia maker. A local buyer in the week inquired for several thousand tons of bessemer for export to Italy.

Greater Demand Expected

Buffalo, Feb. 15.—Furnace interests of the Buffalo district are inclined to figure on an increased consumption on the part of melters within the next month, and that in consequence of the improved activity on the part of the foundries, there will be a more urgent demand upon the producers for iron under contract. Foundries that have not participated in the direct or indirect war order business are apparently becoming more active with the general improvements noted in business everywhere.

The continued demand for iron has caused prices to again stiffen, in some grades from 50 cents to $1 per ton. From the minimum asking price on No. 2 plain, No. 3 foundry and gray forge, at $18.50, the spread covers $1 with a maximum of $19.50 on No. 1 foundry. The average quotation for current needs and last half deliveries on No. 2X foundry is now $19 at the furnace. The higher silicon irons are being quoted up to $21 and $22.

Cleveland Dull But Firm

Cleveland, Feb. 15.—The pig iron market in Cleveland is dull but strong, and Cleveland agencies having furnaces in other districts report a very comfortable business outside the city. While $18.50, furnace, for No. 2 foundry is the price generally paid along the lakes, some sales have been made at Toledo at $18.75. The Cleveland price continues unchanged. Cleveland sellers are quoting $18.50 on No. 2 foundry, valley, with the same price at Cleveland furnace for delivery outside of the city. A very fair tonnage of basic has been sold at $18, valley.

Stalled at Chicago

Chicago, Feb. 15.—Northern foundry and malleable pig iron are marking time, with quotations unchanged, makers asking $18.50 for No. 2 foundry and $19, Chicago furnace, for malleable for any delivery during 1916. Some inquiry is being entertained for last half delivery and orders are being booked constantly for small tonnages for immediate delivery to melters who underestimated their needs

(*For complete prices see page* 410.)

for first half. Neither grade is active and neither buyer nor seller desires to push things.

Dealers in southern iron find little interest on the part of buyers in this territory although information from the south is that a buying movement seems imminent. In view of this expectation, some agents are required to submit all inquiries direct before naming quotations. Most makers are asking $15, Birmingham, for No. 2 foundry, for last half delivery, but some iron at 50 cents per ton less keeps showing itself.

Lake Superior charcoal iron is unchanged with an unusually wide spread of quotations. One producer with his output well sold is asking $1 per ton higher than others not so fortunately situated.

Sales Slightly Improved

Cincinnati, Feb. 15.—A central Ohio melter is in the market for 3,000 tons of northern and southern foundry iron, and an Indiana user wants from 3,000 to 4,000 tons of malleable iron. A Michigan manufacturer is inquiring for from 1,200 to 1,500 tons divided between northern and southern foundry grades. An Indiana melter has taken 500 tons of northern foundry iron, and a user in this territory has purchased 500 tons of Virginia iron. The market is showing a little more activity, but sales are very low in this direct territory. Prices are being kept very firm through good shipments on contracts, and heavy consumption by users, which is holding stocks in furnace yards at a low aggregate tonnage. Southern No. 2 foundry iron is quoted at from $14.50 to $15, Birmingham basis, for the first half, and from $15 to $16 for the last half. Southern Ohio No. 2 foundry is given at $18, Ironton basis, for shipment over the entire year.

Sales Increasing

Birmingham, Ala., Feb. 15.—There was a decidedly better feeling manifested in pig iron circles the past week, and the total sales were even ahead of the week previous. However, there is yet that "heavy-hangs-over-your-head" warrant iron being secretively disposed of at a shaded price. Then, too, sales to buyers direct from producer have been heard of on $14.50 per ton basis for prompt shipment. One large pipe interest stated that it was offered any desired quantity of standard Alabama iron at $14.50 per ton at the furnace for prompt shipment. A majority of the Birmingham producing interests are holding at $15 to $15.50 for first half and $16 per ton for last half delivery. One interest sold a total of 2,700 tons of special analysis iron for last half shipment at $17.50 per ton basis of silicon 2.50 per cent; and an additional 2,000 tons of standard iron at $15 per ton for prompt or first half shipment and $15.50 for last half shipment. Another company sold 1,500 tons on basis of $15.50. Another concern sold 250 tons on basis of $16 for third quarter delivery. There is one Birmingham company that is holding at $15.50 for prompt or first half delivery and $16 per ton for last half delivery.

Very Little Interest

St. Louis, Feb. 15.—Interest continues to lag in the pig iron market in this district, and inquiries are few and for small amounts, with the exception of the one for 1,200 tons of basic iron, which was reported last week and has not been closed. Dealers, however, are confident of a buying movement in the near future.

Sales last week were confined to small lots. Southern No. 2 is offered at $15 to $15.50 for the first half delivery, and at $15.50 to $16 for second half.

Northern iron is held at $18.50 to $19, Chicago furnaces, and $18.50 to $19, Ironton.

Marking Time

Pittsburgh, Feb. 15.—For more than 60 days, the pig iron market for steelmaking grades in this district has been quiet and inactive. While demand for iron has been heavy, yet some merchant furnaces have been able to reserve a considerable portion of their output the first half of the year. Congested traffic conditions, strikes and threatened labor trouble, unfavorable weather conditions and a shortage of gas in some sections have tended to reduce the consumption of pig iron to a moderate extent. It is estimated that there are from 75,000 to 100,000 tons of steelmaking iron available for delivery before July 1, and not much tonnage has been sold for shipment the second half of the year. The fact that the output for the first half of the year has not been contracted for has prevented prices from changing their position the last few weeks. Bessemer iron is selling at a spread from $20.50 to $21, valley, and basic iron is nominally quoted at $17.75 as a minimum. It is not unlikely that a cautious buyer could shade that figure. The American Rolling Mill Co. has opened negotiations for 10,000 tons of this grade for delivery the second half of the year; no other inquiries of importance are pending. Fairly heavy tonnages of foundry and malleable grades are being sold at a spread from $18.50 to $19, valley, for delivery the third and fourth quarters of the year. Since many foundries in the immediate territory are affected by the molders' strike, the situation at Pittsburgh is quiet.

(For complete prices see page 410.)

Deliveries Improved

New York, Feb. 15.—Lifting of freight embargoes by the New Haven, New York Central, Erie, Lackawanna and other roads has cleared the way again for shipments of iron and coke into affected districts in this and nearby territory. The Pennsylvania railroad, however, has not raised its embargo against the New Haven railroad, with the result that many New England consumers still are having trouble getting coke and iron. The situation in general, however, is much improved over the past several months. Marketwise, conditions remain quiet with sales light and scattered. A New Jersey maker bought 5,000 tons of Pennsylvania No. 2 plain and No. 3 for forward delivery. Another sale of 2,000 tons of foundry for shipment outside this territory was closed. A Jersey buyer today asked for 1,000 tons of Nos. 2X and 2 plain and another lot of 2,000 tons quietly is pending. Prices show good stability. No. 2X at tidewater remains around $20. A leading Buffalo maker has advanced its prices for this year's delivery, malleable and foundry grades up to 3 per cent silicon, from $18.50 to $19, furnace, and above 3 per cent to $19.50. Liberal inquiries for export continue to appear, but there are few sales because of the high freights. Italy has offered $50, delivered, for bessemer iron, but this is not acceptable to sellers because the freight is $30 to $35. Export bessemer at tidewater was quoted this week at $23 to $23.50. Italy has out a new inquiry for 1,500 tons of bessemer through a Philadelphia buyer, France for 5,000 tons and Roumania for 1,500 tons of either bessemer or low phosphorus.

The American Metal Wheel Co., Toledo, O., held its annual meeting recently, electing officers and directors as follows: Henry Streetman, president; F. H. Steel, vice president; J. C. McKisson, secretary-treasurer; and C. W. Bennett, general manager. The directors, in addition to the above, include Joseph Roth, J. C. Anderson and Ira C. Taber.

The Heil Co., Milwaukee, Wis., has increased its capital stock from $20,000 to $50,000 to provide for enlargements.

Ferro Very Quickly Taken

At Highest Contract Price on Record—Spot as High as $250—Serious Scarcity at Pittsburgh

New York, Feb. 15.—A rush of buying followed the announcement by English producers of ferro-manganese on Feb. 11, that they could offer a limited tonnage for last-half contracts at a new price of $150, seaboard, or at an advance of $25, a ton, from the previous schedule. For several weeks prior to this development, several English makers had withdrawn from the last-half market and others were restricting their offerings. Within several hours after the news of the advance had been flashed to various market centers, all the tonnage offered had been snapped up at the new price. It is estimated that, at least, 10,000 tons of ferro-manganese on last-half contracts, were bought within several hours, exhausting all that was offered. Sellers state they could readily have disposed of several times the tonnage they did, had larger quantities been available. The last-half market has again tightened up, following this selling movement and practically no English material now is openly available. From 5,000 to $10,000 tons of unsatisfied inquiry remains in the market.

The swiftness with which the consumers snapped up the tonnage placed before them for delivery as far ahead as Jan. 1, 1917, illustrates the general appreciation among buyers of the seriousness of the ferro-manganese situation, especially as to future supplies. The present contract price of $150, seaboard, for ferro-manganese is stated by traders to be the highest figure for extended future delivery reached by the market in this alloy during the present generation, if ever in history. Higher spot and early delivery prices were attained during the Russian-Japanese war, but these did not cover periods so far in the future as the present quotations. Contract ferro-manganese last was advanced on Jan. 8, when it rose from $110 to $125, per ton. The $110 contract price was cabled by English makers on Dec. 27, following the long period of an unchanged level of $100, seaboard. Offerings of spot and early shipment metal are extremely scarce and prices vary practically in accordance with what the holder asks. The market seems to be at about $225 to $250, seaboard, for spot, and consumers were willing this week to take on several hundred tons at these figures, if such a quantity could be obtained. Several cargoes of 80 per cent for shipment in 60 days, were taken this week at $225, seaboard. An offer of $175, seaboard, was made for about two carloads for May-June delivery.

English makers have advised their agents that shortages of manganese ore will make it necessary that they cut down their shipments to this country during March and April. They state that they will be unable to meet full contract specifications during these months. The extent of shipments beyond that time is left in doubt.

There has been continued selling of domestic spiegeleisen for last half at $40, furnace. These sales have run to some thousands of tons, but a report that a single transaction of 30,000 tons for last half had been closed proves an exaggeration. Inquiries now are out for first half of 1917 and domestic makers also have quoted $40, furnace, for that period.

Ferro Scarcer than Hen's Teeth

Pittsburgh, Feb. 15.—The situation for 80 per cent ferro-manganese continues acute and it is likely that some plants will have to close down, unless managers are able to obtain this alloy, prices of which have been skyrocketing for several weeks. As high as $250 a ton at the seaboard has been offered for prompt material and it is understood that some tonnage has been sold at that figure. Domestic makers are being appealed to by anxious consumers in dire need of 80 per cent alloy, but, so far as can be learned, no domestic tonnage is available. The recent proclamation of Germany, announcing its intention to attack merchant ships carrying cannons, has further complicated the future situation for foreign alloy. Spiegeleisen, being substituted whenever possible for ferro-manganese, is advancing steadily in price, now being quoted at $40, furnace, at which figure considerable tonnage has been sold.

Scarcity at Cleveland

Cleveland, Feb. 15.—Buyers in the Cleveland district are finding much difficulty in covering for their requirements of ferro-manganese. Some purchases have been made at $150 per ton for last half delivery and at $200 for prompt delivery. The demand for spiegeleisen is also very active and $40 per ton is paid for first half delivery.

Form New Iron Firm.—Laird U. Park, who for ten years has been connected with Naylor & Co., and Leonard W. Williams, of the Pulaski Iron Co., have formed a partnership under the name of Park & Williams, with offices at 1527 Real Estate Trust building, Philadelphia, to carry on a commission business in iron, steel, ores, alloys, coal and coke. They will be agents for Naylor & Co., The Geo. S. Good Fire Brick Co. and Larlen Coal & Coke.

(*For complete prices see page* 410.)

Warehouse Prices

Are Again Marked Up in Leading Centers

Cleveland, Feb. 15.—Warehouse business in Cleveland continues very active and prices have again been advanced. Bars and shapes have been marked up $2, plates $3, squares, 2 inches and over, $4 and shafting $5. Quotations are now as follows: Squares, 2 inches and over, 2.95c; rounds, 2 inches and over, 3.20c; bars under 2 inches, 2.70c; iron bars, 2.65c; shapes, 2.70c; plates, 2.85c; shafting, 15 off.

Chicago Prices Rise

Chicago, Feb. 15.—An advance of $2 per ton on finished steel products has been put into effect by Chicago warehouses, which raises quotations at St. Paul and St. Louis an equivalent amount. This brings steel bars and shapes to 2.60c, Chicago store, and plates to 2.80c, Chicago store.

Rivets are being sold by warehouses at 2.95c, Chicago, for structural and 3.05c for boiler rivets. This price is less than Pittsburgh mill price plus freight and brings about an unusual situation, entirely out of line with other steel products.

Plates at High Figure

New York, Feb. 15.—Plates continue to be the strongest line of warehouse products in this territory and under a further advance now are quoted at 3.25c, delivered, in metropolitan territory. Structural shapes and steel bars from store have been advanced $2 further and now are quoted at 2.70c, delivered. Warehouse business is very heavy and the great problem of the jobbers is to maintain their stocks.

W. H. Millspaugh, Sandusky, O., and Russell A. Cowles, New York City, have taken over the controlling interest in the Sandusky Foundry & Machine Co., Sandusky, O., which is capitalized at $100,000. Messrs. Millspaugh and Cowles took advantage of option rights secured more than a year ago. A. W. Henn, R. E. Corrigan and William E. Guerin Jr., of Cleveland, have retired from the organization.

Plate Orders Still Pending

Railroads Cannot Find Takers of Tonnage and Ship Builders Are in About the Same Position

Philadelphia, Feb. 14.—From 50,000 to 100,000 tons of car steel, the bulk of which is plates, remains unplaced in the market in this district, because the railroads inquiring have been unable to induce the mills to accept it. The Pennsylvania railroad, which is out for about 25,000 tons, has offered to take part of this during the third and fourth quarters, but still has not been able to find a taker. The Great Northern railroad came east the past week and added its request for about 20,000 tons of steel for 2,000 cars, with no better success than eastern roads. The Lenoir City, Tenn., car plant of the Southern railway remains in the market for 10,000 to 12,000 tons. The Norfolk & Southern has been able to place a small order, 500 to 1,000 tons, with Pittsburgh mills. In these negotiations for car steel, prices have been kept in the background. The main effort of buyers has been to get their requirements on mill books. Ship builders are facing a similar situation and are refusing new orders for vessels, both because their ways are filled far ahead and they cannot protect themselves on the steel required. The Crowell & Thurlow Steamship Co. is about to place two additional boats and many others are pending. Eastern plate makers report the demand for plates is as overtaxing as ever and they are not selling except for delivery at their convenience. Prices range from 2.80c, Pittsburgh, to 3c, eastern mill, or about 2.959c to 3.10c, Philadelphia. One contract for second quarter specifications went through the past week at 3.25c, Pittsburgh. Eastern mills are filled up for six to nine months, much of which is actually specified.

Plates Sell at 3.50c

Pittsburgh, Feb. 15.—Steel plates are the strongest item on the list of finished products. While leading manufacturers are quoting 2.10c for delivery at their convenience, some mills in a position to furnish material for prompt delivery are obtaining as high 3.50c for sheared plates. Numerous sales at 3c are being made. The production of plates and other finished commodities has been reduced this week to some extent, by a shortage of gas in western Pennsylvania, eastern Ohio and West Virginia. Congested traffic conditions have interfered with shipments to eastern territory.

High Plate Prices

Cleveland, Feb. 15.—The market for plates continues very strong and Cleveland mills are experiencing no difficulty in selling ¼-inch and heavier at 2.75c, Pittsburgh, while 3/16-inch is sold at 2.85c. No. 10 blue annealed sheets are also quoted by Cleveland makers at 2.85c, Pittsburgh. Two Norwegian freight vessels placed this week with the Manitowoc Shipbuilding Co. will require 2,300 tons of plates and shapes each, and the builder probably will not be able to obtain delivery of the plates until late in the year.

Book Plates for 1917

Chicago, Feb. 15.—Steel plates are quoted at 2.29c, Chicago mill, for delivery at the convenience of the mill. Purchases at this price provide that no delivery can be expected earlier than fourth quarter of the present year and under existing circumstances buyers understand that in all probability they will receive nothing on present orders until after Jan. 1. For prompt delivery premiums bringing the price close to 3.00c, Pittsburgh, are being asked and paid gladly. A recent inquiry for 1,500 tons of ship plates for export to the Orient is being entertained by an Ohio mill and the inquirer has hopes of placing the business, although no price has yet been named.

Pipe is Up

Prices are Advanced from $2 to $4 Per Ton

Pittsburgh, Feb. 15.—The National Tube Co. today advanced prices of standard black and galvanized steel pipe, 12 inches and under in diameter, one point, or approximately $2 a ton. Line pipe was put up one point and oil country goods were advanced about $4 a ton. The last previous advance in prices was under date of Jan. 20, when an irregular advance of from one to three points was made. Steel boiler tubes are unchanged in position. Manufacturers of iron pipe plan to put up prices one point.

Demand for tubular goods the last 60 days has been abnormally heavy. No large single contracts have been placed, but a multiplicity of small orders has been sent to the mills, causing deliveries to fall behind from 10 to 20 weeks.

(For complete prices see page 410.)

Advance Effective

Youngstown, O., Feb. 15.—The expected advance of one point on all grades of steel pipe became effective here today. The $2 a ton advance affects all sizes of black and galvanized pipe, 12 inches and under, standard extra heavy and double extra heavy pipe, line pipe and oil country goods.

Cast Iron Pipe

Is in More Active Demand in West—Prices are Steady

Chicago, Feb. 15.—Cast iron pipe is more active than for several weeks and a number of inquiries are being figured. Prices remain firm at former quotations, following the lull in pig iron advances.

Figures were opened at Kalamazoo, Mich., Feb. 14, on 300 tons and at Rockford, Ill., Feb. 16, on 660 tons. Bids are to be taken at Bay City, Mich., Feb. 18, on 275 tons, at Sylvania, O.; Feb. 18 on 375 tons, at St. Louis; Feb. 25 on 7,200 tons, and at Bloomington, Ind., Feb. 24, on 800 tons.

The American Cast Iron Pipe Co. has taken 1,700 tons for the city of Milwaukee and the United States Cast Iron Pipe & Foundry Co. has taken 1,085 tons at Kansas City, Mo.

Competition Not Active

New York, Feb. 15.—In the anticipation of more liberal tonnage later, especially from municipalities, eastern cast iron pipe makers are not competing sharply for business and prices are holding steady. The shops are well supplied with orders for small sizes, but all of them could accommodate a tonnage of larger diameters. New York City is making preparations to bring out a liberal requirement soon, estimated in advance at about 5,000 tons. The United States Cast Iron Pipe & Foundry Co. has received 740 tons for Worcester, Mass., at $33, delivered for the 4's and $30 for the other sizes and 450 tons for Pawtucket, R. I., at $32.25, delivered for the 4's and $29.25 for the other sizes. The Queensborough Gas & Electric Co. recently placed 1,000 tons of 4 to 12's and the Bronx Gas & Electric Co., 500 tons, which went to eastern Pennsylvania shops. Pittsfield, Mass., will take bids Feb. 25 on 400 to 500 tons of 24's; Woonsocket, R. I., Feb. 18 on 250 tons of 8 and 12's; Albany, March 6 on 565 tons of 6 to 36's, and Hamilton, Ont., March 1 on about 750 tons of 3 to 16's. Florinapolis, Brazil, has placed a trial lot of

100 tons of 8 and 12's with the United States Cast Iron Pipe & Foundry Co. Many other export matters are pending in various forms but action is slow.

Conditions Favorable

Birmingham, Ala., Feb. 15.—Manufacturers of cast iron pipe report not only good business, but very favorable prospects for an increase. One interest has raised its prices $1 per ton, yet another large interest is willing to sell on the basis of the old prices—that is, the $24 and $27 schedule, with $1 advance for gas pipe. The aggregate tonnage booked during the week is said to be satisfactory. Following prices are quoted for standard 4-inch to 6-inch, $28; 6-inch and up, $25, with the addition of $1 per ton extra for gas pipe and all 16-foot lengths.

Steel Bars Are Very Strong

Makers of Large Rounds Name High Quotations —Offer of 6,000 Tons at 3.50c Declined

Philadelphia, Feb. 14. — Makers of large rounds for munition purposes in the east still hold out for a price of 3.50c to 4c, mill, for last half. They have taken no orders at this figure and have declined an offer of 3.50c for 6,000 tons of large rounds for a domestic shell maker for shipment before July because they could not spare the steel. Numerous negotiations for shell steel and finished shells for last half or beyond continue to be carried on. The opinion is expressed in well-informed circles that the main reason for the delay in their closing is their dissatisfaction with the prices for steel which a number of the mills are asking. The regular steel bar market shows a continuation of the policy of the mills to sell, as nearly as possible, only against specific needs and not to make open contracts. The nominal price for bars for delivery as the mill is able is 2c, Pittsburgh, or 2.159c, Philadelphia. For early and assured delivery, premiums of $5 to $7 a ton are being paid by consumers. Some makers who have been out of the market entirely and were expected to reappear with offerings for third and fourth quarters, still are holding back. Shafting has been advanced to 35 and 40 off and jobbers here have sold at 25 off.

Steel Bars Scarce

Chicago, Feb. 15.—Soft steel bars are practically unobtainable except in rare instances and then at a heavy premium over prevailing quotations. The nominal quotation is 2.19c, Chicago, a price at which some makers are booking tonnage for delivery at the convenience of the mill, which practically means after Jan. 1, 1917. On tonnages for prompt delivery, in the rare instances where this can be obtained, buyers are paying as high as $2.50c, Chicago, and seem glad of the opportunity.

Hard steel bars rerolled from rails are now quoted at 2.00c, Chicago mill, and in the face of scarcity of soft steel bars, this price seems likely to be increased. Immense demand for reinforcing steel promises to fill up existing capacity, which is not large, and demand for hard steel to fill a gap made by scarcity of soft steel promises to put a burden on this product as soon as the building season opens.

Strong at Pittsburgh

Pittsburgh, Feb. 15.—Representatives of entente nations are negotiating for tremendous tonnages of shrapnel rounds for shipment the third and fourth quarters of this year, and first quarter shipments are being talked about by some prospective buyers. Manufacturers, however, do not appear anxious to accept shrapnel steel contracts for extended delivery, apparently preferring to meet the needs of domestic consumers. Steel bars for shipment at the convenience of the mill, are commanding 2c. Attractive premiums, ranging from $5 to $15 a ton, are being paid for nearby delivery.

Very Heavy Pressure

Buffalo, Feb. 15.—The demand upon the mills is increasing the difficulties of the situation with each passing week. The pressure for deliveries has become more pronounced than has been noted in the past six months. Many of the mills are booked up to a point where deliveries on existing tonnages in some cases will be forced beyond the end of the present year and into the early part of 1917. One of the large bar users of the Buffalo district, failing to obtain all the required material from regular sources of supply, has reported an unsuccessful effort to get the needed tonnage booked by other mills, irrespective of terms. Mills report that a number of the consumers who have specified in full for their first-half contract tonnages are now endeavoring to get mills to book additional quantities for them, but without success. Prices remain firm.

Pressing Deliveries

Cleveland, Feb. 15.—The demand for steel bars, shapes and plates continues very active in the Cleveland district and consumers are making extraordinary efforts to obtain deliveries. Numerous trips have been made to Pittsburgh in order to hasten deliveries, but without much success. The leading interest is quoting 2c on shapes and bars and 2.10c on plates for such delivery as the mills can make. When protection is given in the case of specific jobs, delivery cannot be promised before the fourth quarter, but that fact does not stop the making of contracts. Except in the case of specific jobs, the only contracts made are based on third quarter specifications.

Bar Iron to Advance

Chicago, Feb. 15.—The situation as to bar iron is exceedingly strong, and one producer in this district is entirely out of the market and will be for several weeks. With sufficient tonnage specified to keep its mill busy for 60 days, there is no incentive to book further contracts, and this interest announces it will take no further business until part of the tonnage already booked has been delivered.

Although other interests are still taking business at 1.90c, Chicago mill, with some tonnages bringing 2.00c, Chicago mill, every indication is that before the end of the present week the minimum quotation will have disappeared, and the market will be on a basis of 2.00c, Chicago.

Hoops, Bands and Shafting

Pittsburgh, Feb. 15.—A Buffalo interest has sold a small tonnage of cold rolled steel shafting at 10 per cent above the list price, the highest quotation reported in many years. Warehouses are having no trouble in obtaining 15 per cent off the list. Manufacturers now uniformly are quoting cold rolled shafting at 40 per cent off the list for carloads and at a spread from 30 to 35 per cent off the list for less than carloads.

Steel bands are firmly held at 2c and hoops are commanding 2.20c for future delivery. Cold rolled strip steel has been advanced $5 a ton, to 4.25c base.

The Thomas Iron Co., Hokendauqua., Pa., for the second time in six months, has raised the wages of its employes 10 per cent. The Empire Steel & Iron Co., Catasauqua, Pa., has taken similar action.

(For complete prices see page 410.)

Unusual Sheet Conditions

Due Largely to High Price of Spelter, Which Reduces Demand for Galvanized Product

Youngstown, O., Feb. 15.—The sustained demand for heavy sheets continues to upset normal conditions in this market. Both the domestic and foreign trade are consuming more than their ordinary quota of heavy sheets in large widths, while high spelter prices have caused a falling off in the demand for light galvanized sheets. Mills equipped to handle the heavier grades are operating under high pressure, while those rolling the lighter gages, which ordinarily are active even when the heavy mills are idle, are running on part time. As an example, one sheet mill in this district, which rolls light gages, is closed down this week, the manufacturer being enabled to secure a larger profit on his semi-finished steel. This mill probably will resume shortly.

These abnormal conditions are clearly reflected in the action taken today by one maker in establishing his base price on No. 28 black sheets at 3.20c. The market for this grade is 2.60c to 2.75c and the action of this maker is taken to indicate that he will confine his attention to rolling heavier gages, on which the margin of profit is much greater. The 3.20c base was set arbitrarily by adding the 0.45c differential between this grade and No. 10 blue annealed. This grade is firm and in strong demand at 2.60c to 2.80c, and this maker states that he has taken a considerable volume of tonnage at 2.75c. The mills rolling light gages at this plant have been closed down, and only the heavy mills will be operated for a time. The failure of the light gage sheet market to follow the advances in heavy sheets has resulted in completely overturning the usual differentials between the two grades. Under normal conditions the demand is heaviest for the lighter gages, with the result that the capacity in this district for rolling gages from No. 16 to 28 is much greater than for handling heavy sheets of No. 10 to No. 16 gage. This large light sheet finishing capacity has resulted in active competition for the decreased business coming out, with a consequent softening of this market in comparison with heavy sheets. One maker points out that one mill equipped to roll heavy blue annealed sheets is a larger money maker today than four light gage mills. There is some tendency towards strength in the market for light gages, but the 2.50c minimum on this grade has not completely disappeared.

The market for galvanized sheets is still held in check by the abnormal prices for spelter. Prohibitory prices on this grade, with the resultant decline in the roofing trade, forces most galvanizing mills to operate under 25 per cent of capacity. The roofing trade ordinarily consumes about 60 per cent of the galvanized sheets turned out in this district. The export demand for the galvanized grades continues. Few sales have been made, but the market is firm at 4.75c to 5.25c for No. 28.

Steel Sheets Active

Pittsburgh, Feb. 15.—Demand for steel sheets continue heavy and deliveries are more deferred. Manufacturers in western Pennsylvania are refusing to sell black sheets at less than 2.60c for No. 28 gage and some mills are obtaining $2 and $3 a ton above that figure for open hearth material. Deliveries of blue annealed sheets are deferred 18 and 20 weeks, and prices are strong. Galvanized sheets are selling in small lots at 4.75c for No. 28 gage. Automobile and electrical equipment manufacturers have been endeavoring to obtain additional tonnage for shipment before July 1. Many consumers now are specifying against contracts placed for second quarter shipment.

Mills Sold Up

Philadelphia, Feb. 14.—Eastern Pennsylvania sheet makers have not been able to quote because of their sold-up condition on the large tonnages of light gages recently placed before them for shipment to France. The eastern mills are virtually out of the market where shipment before July is wanted, but they are making some sales for delivery at their convenience where buyers insist on making additions to contracts completely specified. Prices up to 3c, Pittsburgh, for No. 10 gage blue annealed are being obtained in such cases. The Pennsylvania railroad is in the market for a round tonnage of heavy sheets for steel box car construction at Altoona.

Active at Cincinnati

Cincinnati, Feb. 15.—The sheet market continues active, especially for immediate deliveries. Demand for blue annealed sheets is falling off slightly, but this grade is still selling in excess of either black or galvanized. Prices are unchanged, but very firm. No. 1 blue annealed are quoted at 2.75c, galvanized No. 28 gage at 5c, and black No. 28 gage at from 2.65c to 2.75c, all Pittsburgh basis. Warehouse prices are as follows, Cincinnati basis: Blue annealed No. 10 3.15c; galvanized No. 28, 5.25c, and black No. 28, 3c.

Sheets Are Irregular

Chicago, Feb. 15.—Considerable irregularity exists in the price of sheets, both black and blue annealed. Ordinary schedules of differentials are of no avail and every inquiry seems to be an individual case without regard to others. As the situation seems to be developing, black sheets heavier than No. 16 gage are being figured on the ordinary blue annealed basis while No. 18 gage or lighter are being figured on the ordinary black sheet scale. The matter of width is another factor and sheets less than 36 inches wide are more easily obtained than wider sizes, as a result of a larger supply of the narrower product.

No. 28 gage black are being quoted at 2.79c to 2.94c, Chicago, while No. 10 gage blue annealed are quoted at 2.94c, Chicago.

Tin Plate Held at $4.

Pittsburgh, Feb. 15.—Most independent manufacturers of tin plate are quoting $4 per base box, but the $3.75 figure has not been withdrawn entirely. Specifications from domestic consumers are heavy and a number of attractive orders for export have been booked the last fortnight. Manufactruers are complaining about the shortage of sheet bars and the uncertainty of shipments.

One interest last week sold 300 tons at 4.25c, Pittsburgh, or $5 above the maximum quotation on this grade.

(*For complete prices see page* 410.)

Buys Electric Equipment

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has taken an order from the Phillips Sheet & Tin Plate Co., Weirton, W. Va., for the complete electrical equipment of the mill being built. The Phillips company manufactures sheet and tin plate, and produces cold rolled strips. The contract calls for two 3,000-kilowatt, 3-phase, 60-cycle, 6,600-volt turbo-alternators; one 1,500-horsepower constant-speed alternating-current motor; one 2,500-horsepower and one 800-horsepower adjustable speed motor. The speed adjustment of about 50 per cent from high speed is obtained on the 2,500 and 800-horsepower motors through direct current synchronous control, a novel scheme devised by the Westinghouse engineers.

Scrap Moves More Freely

Lifting of Embargoes Helps, But Market is Dull in Most Centers, With Some Weakness

Chicago, Feb. 15.—Continued slight decline marks the scrap iron market in Chicago. A number of items have lost about 25 cents per ton during the past week and others are decidedly weak.

There is practically no buying except occasional bargains picked up from holders who are anxious to convert their material into money. Steel works apparently have a considerable supply and are not desirous of adding further tonnage. Some consumers who had good reserves before the market reached its apex have been able to keep up supply by taking advantage of low price offers and probably will not be forced into the market as buyers for several months.

Railroads, which sold considerable tonnages during the past two weeks, seem to have cleaned up a large part of their castoff material and this week only one list is current. This is issued by the Chicago, St. Paul, Minneapolis & Omaha railroad and offers 644 tons.

Weak at Cincinnati

Cincinnati, Feb. 15. — Weakness in prices predominates the scrap market. Conditions should be much better and, if compared with pig iron, scrap iron prices should be at least $2 above present quotations. Stocks in dealers' yards are heavy and gradually increasing, and the surplus available throughout the country is far above demand. Heavy melting steel is now selling at from $13.75 to $14.25 per gross ton, mixed cast at from $10.25 to $10.75 per net ton, bundled sheet scrap at from $8.50 to $9 per net ton, and No. 1 machine cast at from $11.50 to $12 per net ton.

Cleveland Market Dull

Cleveland, Feb. 15.—There is very little activity in the Cleveland market, and such sales as have been consummated have been almost exclusively between dealers. The fact that there is a large amount of material in the yards and the unusually open winter has tended to weaken the market generally. There are no instances of concessions and prices on the whole remain the same despite a feeling of dullness. Heavy melting steel is quoted at $16.25 to $16.75 gross tons, unchanged from last week.

Much Uncertainty

Pittsburgh, Feb. 15.—Although one of the most cautious buyers of scrap in this district last week paid $18 a ton for 2,000 tons of heavy melting scrap, reports of material selling at rather low figures are heard. It is understood that some heavy melting steel has been offered at $17.50, delivered, but there has not been enough activity to severely test prices. In many respects, the scrap market is similar to that for pig iron, consumers being well provided for needs the next two or three months. Dealers are carrying tremendous stocks of all grades of scrap.

Moving More Freely

Philadelphia, Feb. 14.—Lifting of freight embargoes at Lebanon and Harrisburg has not helped the volume of trading in the old material market in eastern Pennsylvania, but it has made possible a freer movement of scrap and has improved the general tone. Present shipments of scrap are so heavy that consumers seem to be well supplied and are not forced to buy liberally. Current sales, consequently, run to small amounts. At the same time, the larger buyers are interested in tonnages for future delivery, but the dealers and brokers are acting shyly toward such business because they do not consider it safe to discount the future under present conditions. One leading eastern Pennsylvania steel maker has closed for 5,000 to 6,000 tons of heavy melting steel at $17, delivered. Small lots still are going at $16.50, delivered. An eastern Pennsylvania steel maker sold 1,000 tons of low phosphorus at $22.50, mill, or about $23, delivered.

More Business

Birmingham, Ala., Feb. 15.—The volume of business transacted by the old material interests was considerably larger last week than for several weeks previous, and it is learned that prices are stiffening—especially for steel scrap and strictly No. 1 machinery scrap. Inquiries have very materially improved, and on the whole scrap dealers are more hopeful in every respect.

The Beach Glen Iron Mining Co., of Dover, N. J., with capitalization of $250,000, has been incorporated by Benj. Nicoll, of B. Nicoll & Co., of New York; Cortlandt Nicoll and Wm. H. Tonking, of Dover. The company has taken over the Beach Glen mine, near Rockaway, N. J., which was owned by Benj. Nicoll. The ore is a low phosphorus magnesite. The property has not been operated for many years and it has not been decided whether it will be reopened at this time.

(*For complete prices see page* 410.)

Coke is Scarce

Owing to Shortage of Cars and Labor —Production Decreases

Pittsburgh, Feb. 15.—Shipments of Connellsville coke continue uncertain, due to congested traffic conditions, and as high as $3.75, ovens, has been paid for spot blast furnace fuel this week. Despite the shortage of coke, demand for prompt fuel is not heavy and no large sales are reported. Casting manufacturers are figuring rather prominently for immediate requirements and some contract tonnage has been placed for shipment over extended periods. It is understood that 72-hour coke for future shipment has been obtained at $3.50, ovens. *The Connellsville Courier* says production of coke in the upper and lower Connellsville regions for the week ending Feb. 5 was 433,182 tons, a decrease of 9,434 tons, compared with the week previous.

Advance on Contracts

New York, Feb. 15.—Large makers of standard 72-hour foundry coke now are taking 12-month contracts beginning July 1, at a price of $3.50, Connellsville. This represents an advance of about $1 a ton over the market on the corresponding date a year ago. A number of contracts have been closed by eastern consumers during the past few days for the year's delivery beginning July, at the price stated.

Foundry Supply Short

Cleveland, Feb. 15.—Many Cleveland foundries have been on the ragged edge during the past week in regard to their coke supply and much difficulty has been experienced in obtaining deliveries, owing to a shortage of labor and cars. The usual quotation for foundry coke is, however, $3.75, although the Rainey price is $4 on contract and higher prices are asked for prompt delivery.

Demand for Spot Coke

Cincinnati, Feb. 15. — The southern coke market continues to drift along with very few developments. Demand is centered almost entirely upon spot fuel, which is very scarce. Production in the Wise county, Pocahontas and New river districts is about equal to consumption, and as users are specifying full shipments on their contracts, a very small tonnage is left for the spot

market. Wise county contract furnace coke is given at from $2.85 to $3.10, ovens, Pocahontas furnace contracts at from $2.75 to $3, ovens, and New River contract furnace at from $3 to $3.25, ovens. Foundry coke is being held at from 50c to 75c per ton above furnace prices in all three districts.

High at St. Louis

St. Louis, Feb. 15. — Connellsville 72-hour foundry coke is strong at $4 to $5, ovens, some having been sold in this district as high as $6 a ton. Virginia foundry coke, standard grades, are held at $3.75 a ton. The inquiry is light.

Wire Products

Are Again Advanced $2 — Highest Prices for 15 Years

Pittsburgh, Feb. 15.—Wire products on Feb. 11 were advanced $2 a ton to $2.30 a keg for nails and $2.15 per 100 pounds for plain wire, the highest prices to prevail for 15 years. The last time wire nails were quoted at $2.30 a keg was on Jan. 29, 1901. Discounts for woven wire fencing have been lowered one point to 63½ off the list; cut nails have been put up $2 a keg to $2.20, and cement coated nails likewise were advanced $2 a ton to $2.20. New business continues to be limited to 60 and 90-day contracts. Most mills are sold up for the remainder of the first half of the year.

High Rod Prices

New York, Feb. 15. — Some recent heavy sales of wire rods to domestic consumers have been made by large producers on the basis of $50, Pittsburgh. It is reported other mills have made sales up to $60, Pittsburgh. There continues to be no fixed level to the wire rod market and makers are quoting such prices to the consumers as the latter are able to pay, in accordance with the market for which they are finishing this steel. All the makers now are quoting the new prices on wire products announced by the American Steel & Wire Co., effective Feb. 14. Quotations continue to be limited to 90-day contracts.

Chain is Higher

Cleveland, Feb. 15. — The price of chain has again been advanced from 4c to 4.50c per pound, or $10 a ton. The last previous advance was $5 a ton, on Jan. 4.

The Union Steam Pump Co., Battle Creek, Mich., has increased its capital stock from $600,000 to $1,000,000.

High Prices for Shapes

Are Causing Some New Construction to be Delayed, But Building of Munition Plants is Pushed

Philadelphia, Feb. 14.—High prices for plain and fabricated structural material more clearly are having a deterrent effect upon new construction in this territory. Companies which have been contemplating the erection of new commercial or manufacturing buildings have found that the estimated cost over a year ago has increased from 75 to 100 per cent, due to the advance in steel, other materials and labor, consequently they have abandoned, temporarily, these enterprises. The city of Philadelphia, which some months ago began to place contracts for extensive rapid transit extensions, is holding back any further awards and it is currently understood that this has been due, in a large measure, to the higher cost. Mill buildings for munition manufacture and other construction directly benefiting from the extraordinary profits of present conditions, are going forward steadily. The Baldwin Locomotive Works still is placing numerous extensions to plants in this city and at Eddystone, Pa. The fabricating shops generally are operating at only about two-thirds capacity. Despite the falling off of fabricated building work, the eastern Pennsylvania shape mills have all the tonnage they can turn out and are booked months ahead. Some of them are pursuing the policy of selling only what they can deliver within three months. The practical eastern mill minimum on shapes now is 2.10c, Pittsburgh, or 2.259c, Philadelphia. A fair tonnage of large beams was sold to a western buyer this week for forward delivery at 2.25c, eastern mill.

Bring Premiums

Pittsburgh, Feb. 15. — Structural shapes for prompt delivery are commanding premiums ranging from $5 to $10 a ton. Mills are offering to book tonnage for delivery at their convenience at 2c, but it is impossible to place contracts unless specifications can be furnished. Fabricating shops are being driven at maximum capacity and some plants are not attempting to take additional tonnage for delivery the next six months.

Canton Contracts

Cleveland, Feb. 15.—While there is not much activity in structural material in the city of Cleveland, a number of contracts have been placed and are to be placed in northern Ohio. The Canton Bridge Co. has taken contracts for 600 tons for a building for the Canton Motor Co., Canton, O., and the Timken Roller Bearing Co., Canton, O., 700 tons. Bids are being received this week on 750 tons for the Gier Pressed Steel Co., Lansing, Mich., and 230 tons for the Seneca hotel, Columbus, O.

Small Tonnages Awarded

Chicago, Feb. 15.—Lettings of structural steel in the west during the last week are confined to small tonnages, with the exception of the Ohio street bridge at Kansas City, Mo., for the Kansas City Southern Railroad Co., involving 1,300 tons, which has been taken by the American Bridge Co. Other bridge work, steel for extensions at Gary and some railroad construction make up the remainder of the new tonnage.

Steel shapes are quoted at 2.19c, Chicago mill, nominally, and the present price is believed to have the same effect in discouraging construction work in some instances.

CONTRACTS AWARDED.

Kansas City Southern Ry. Co., Ohio street bridge at Kansas City, 1,300 tons, to American Bridge Co.

Indiana Steel Co., bottom house for duplex plant, Gary, Ind., 400 tons, to American Bridge Co.

High School building, Springfield, Ill., 297 tons, to Spuck Iron & Foundry Co.

Santa Fe Railroad Co., blacksmith shop, Albuquerque, N. M., 241 tons, to Missouri Valley Bridge & Iron Co.

Santa Fe Railroad Co., blacksmith shop at Topeka, Kas., 241 tons, to Lackawana Bridge Co.

Spokane, Portland & Seattle Ry. Co., towers, machinery, etc., for bridge at Harrisburg, Ore., 192 tons, to Wisconsin Bridge & Iron Co.

Duluth, Missabe & Northern Ry. Co., extension to highway trestle over Proctor yard tracks, Proctor, Minn., 172 tons, to American Bridge Co.

Building for the Canton Motor Co., Canton, O., 600 tons, to the Canton Bridge Co.

Building for the Timken Roller Bearing Co., Canton, O., 700 tons, to the Canton Bridge Co.

Barge canal bridges at Lyons and Rochester, N. Y., 1,700 tons, to the Phoenix Bridge Co.

Buildings for the Eastern Institution for Feeble Minded and Epileptics, Spring City, Pa., 500 tons, to Pittsburgh Bridge & Iron Co.

Office building and immigrant station for the Pennsylvania railroad at Philadelphia, 400 tons, to Jones & Laughlin Steel Co.

Delaware school, Syracuse, N. Y., 600 tons, to independent shop.

Sibley, Lindsay & Curr Co., Rochester, N. Y., store addition, taking 450 tons, to Phoenix Bridge Co.

Ten Eyck Hotel, Albany, N. Y., hotel ad-

(*For complete prices see page* 410.)

dition, 1,400 tons, to Ferguson Steel & Iron Co., Buffalo.

Merchant's National Bank building, Middletown, N. Y., 200 tons, to independent shop.

CONTRACTS PENDING.

Subway section, Brooklyn, 300 tons, bids pending.

Gier Pressed Steel Co. building, Lansing, Mich., 750 tons; bids being received this week.

Seneca hotel, Columbus, O., 230 tons; bids being received this week.

Billet Scarcity

May Be More Serious in Second Half of This Year

Pittsburgh, Feb. 15.—Unless a sudden change occurs in general business conditions, the situation for semi-finished steel products will be more acute the second half of the year than at present. Manufacturers of billets and sheet bars say they will be forced to reduce tonnages when contracts are entered for shipment the second half of the year. Specifications for skelp are increasing in volume and the pipe trade probably will become more active as the second quarter approaches. Many sheet mills have had to reduce their rolling schedules because of inability to obtain necessary sheet bar tonnages. Bessemer steel products are listed at a spread from $34 to $35, and open hearth material is commanding from $35 to $40 a ton at either Youngstown or Pittsburgh. Forging billets are held at $55 a ton. Wire rods nominally are quoted at $50, Pittsburgh, although it is doubtful if material could be obtained at less than $55.

Can't Supply the Demand

Philadelphia, Feb. 14.—Considerable tonnages of billets and other semi-finished forms recently inquired for from eastern Pennsylvania mills, remain unsatisfied because makers do not want to add to their obligations except with regular customers and then only when pressure is exerted. Two eastern buyers who have been in the market for about 25,000 tons of large sized billets, it proves, desire these for munition purposes and they still are negotiating. A new eastern Pennsylvania buyer who inquired for 1,000 tons of slabs is having trouble to get makers to quote. Eastern makers, where they sell, continue able to obtain from $43 to $45, mill, for open hearth rolling, and from $55 to $60, mill, for forging billets. Odds and ends of billets from mill stocks are bringing high prices.

Few Sales Made

Youngstown, O., Feb. 15.—While the market for semi-finished materials in the valleys is firm, fewer sales were made during the past week. This condition does not indicate a slackened demand, but results almost altogether, from the inability of buyers to secure anything like prompt delivery in considerable tonnages. Bessemer billet and sheet bars are firm at $34 to $35, with open hearth grades bringing from $1 to $5 a ton higher. A small sale of open hearth billets was made a few days ago at $39. Some sheet mills which are not fully covered for second quarter material, are expected to enter the market, and some question exists whether they will be able to secure the full tonnage desired even at the increased price.

Railroad Inquiry

Includes Many Locomotives — Rails Wanted for Export

New York, Feb. 15.—A very heavy inquiry for locomotives is the feature of the equipment market. As previously stated, it is estimated that there are, at least, 600 locomotives now in the market. Among these inquiries are 175 for the New York Central lines, 50 for the New Haven, 20 for the Bessemer & Lake Erie, and numerous others. The problem of builders is to obtain the steel for the construction of this new motive power. The American Locomotive Co. has received an additional order of 25 locomotives from the Cuba Railway Co., and one from the Central Steel Co. The Baldwin Locomotive Works is reported to have taken a large contract for locomotives for English delivery.

In cars, the principal award of the week has been the distribution of about 3,500 cars by the Southern Pacific railroad, which still is in the market for about 1,200 cars. The Ralston Steel Car Co. received about 2,300 flat, box and stock types and 275 car bodies, while the Haskell & Barker Car Mfg. Co. was awarded 1,000 box and 200 to 300 gondolas. The Bessemer & Lake Erie railroad is on the verge of distributing its order for 2,500 cars. The Baltimore & Ohio railroad, which has been inquiring for 500 refrigerator cars, is reported will build these at its own shops. The 1,000 hopper cars asked by the New York Central are understood to be for the Pittsburgh & Lake Erie.

The Erie railroad has placed 4,000 tons additional of rails with the Carnegie Steel Co. The Long Island railroad is in the market for 8,000 tons of 80 and 100-pound rails. New York City rapid transit companies continue in the market for about 20,000 tons of 75 to 150-pound contact and 100-pound running rails. Export inquiries now receiving the attention of makers total about 100,000 tons, coming chiefly from Russia, France and Italy. Some of the French rails may be shipped to Egypt. It develops that a sale of 60,000 tons of rails made at $38, seaboard, for export shipment in 1917, as reported several weeks ago, calls for light and not standard sections.

(*For complete prices see page* 410.)

Rail Buying at Cleveland

Cleveland, Feb. 15.—The rail market is more active and considerable business is pending. The Wheeling has purchased 5,000 tons from the Carnegie Steel Co. and 1,000 tons from the Lackawanna Steel Co. The Cleveland Railway Co. is about to close an order for 3,000 7-inch T rails with the Lorain Steel Co. and 1,000 6-inch T rails with the Lackawanna Steel Co. An inquiry for 5,000 tons of light rails for export is pending. The Cleveland Railway Co. is in the market for 500 tons of 80-pound rails, and if present plans of extension under consideration of the city council are adopted, it will require about 5,000 tons of heavier rails at a not far distant date.

More Cars Placed

Chicago, Feb. 15.—The Standard Steel Car Co. has taken 1,000 gondolas for the Lackawanna Railroad Co. and Haskell & Barker Car Co. has been awarded 1,000 box cars and 250 gondolas for the Southern Pacific Railroad Co. These cars are taken for delivery early in 1917 as steel cannot be obtained for them earlier. The material has been contracted with a western mill at current prices for delivery at convenience, but not before fourth quarter of 1916.

The purchase by the Southern Pacific railroad is from an inquiry for about 4,500 cars, and it is understood the Ralston Car Co. has been awarded about 2,000 cars in addition to those taken by Haskell & Barker.

Will Operate in Full

The American Car & Foundry Co. at Madison, Ill., has received orders from railroads approximating $1,000,000, and it is expected that the plant will be running at full capacity soon, which will mean the employment of more than 300 men. An order from the Baltimore & Ohio railroad for 2,000 steel hopper cars was received by the company within the last few days.

Spikes Advanced

Pittsburgh, Feb. 15.—Standard railroad spikes have been advanced $2 a ton to 2.35c. Smaller sizes are commanding from 2.60c to 2.75c. Demand is heavy, although no large single contracts have been placed recently.

May Be Taken By Schwab

Negotiations for the Transfer of the Pennsylvania Steel Co. at 100 for Preferred and 40 for Common Stock

New York, Feb. 15.—A revival of negotiations begun last fall and broken off because of a failure to reach an agreement as to terms, may result in the transfer of the Pennsylvania Steel Co. to Charles M. Schwab and Bethlehem Steel Co. interests. Several conferences on this matter have been held at Philadelphia during the past few days between Mr. Schwab and W. H. Donner, chairman of the Pennsylvania Steel Co., who is credited with the ownership of 38 per cent of the stock of the company, and representatives of the Pennsylvania railroad, which has a 37-per cent interest, and of the Reading Co., which owns 11 per cent. Nothing official beyond the admission that negotiations are under way has been given out by any of the parties directly concerned. It is learned from interests who are well informed of the details and progress of the conferences, however, that an official announcement of definite action may be made in a few days.

Current reports have it that the owners of the stock are holding out for a price of 100 for the preferred and 40 for the common stock. It is understood that Mr. Schwab has offered payment in 20-year 5 per cent collateral trust bonds to be guaranteed by the Bethlehem Steel Co.

Speculation in the steel trade as to the main purpose for which Mr. Schwab and the Bethlehem Steel Co. are seeking the Pennsylvania Steel Co. picks properties of the Maryland Steel Co., with a steel works and shipbuilding plant on tidewater at Sparrows Point, Md., and the extensive iron ore holdings of the Spanish-American Iron Co. in Cuba, as the attractive factors. Both the Maryland Steel Co. and the Spanish-American Iron Co. are subsidiaries of the Pennsylvania Steel Co. The latter is the leading iron ore operator in Cuba and has been producing from 800,000 to 1,000,000 tons annually from these properties in recent years.

Proposed Merger Off

New York, Dec. 15.—With the failure of M. L. C. Kachelmacher and associates to exercise their option on the Empire Steel & Iron Co., Catasauqua, Pa., which expired Feb. 14, and on the Thomas Iron Co., Easton, Pa., which expired Feb. 11, the proposed merger of eastern blast furnace properties has fallen through. Difficulty in financing the plan is commonly ascribed, in well informed circles, to the failure of the enterprise.

The Kachelmacher interests in January took up their option on the properties of the Wharton Steel Co. at Wharton, N. J., consisting of several blast furnaces and iron ore mines, the reported price being $1,500,000. Under the terms of the option, however, a term of days was allowed for clearing the title. It is understood the title has not yet been passed. Just what effect the dropping of the Thomas and Empire options will have on this transaction is not clear at present.

Under the options, the Thomas Iron Co. was to have been purchased at $3,500,000. The price for the Empire Steel & Iron Co. never had been authoritatively stated, but it was considerably larger than for the Thomas Iron properties.

Will Vote on Increase of Stock

Stockholders of the Midvale Steel & Ordnance Co. will hold a special meeting March 11 to act upon the proposed increase from the present authorized capital from $100,000,000 to $150,000,000. According to the plans of financing the recent purchase of the Cambria Steel Co., the remaining unissued stock, or $25,000,000 of the original capitalization and $50,000,000 of 20-year, 5 per cent, collateral trust, sinking fund bonds, convertible into stock at $100 per share, will be made as payment. This will exhaust the present capital stock of the company. The company has extended until March 21 the privilege of its stockholders to subscribe at $60 a share to the extent of one-third their present holdings for the $25,000,000 of new stock. Drexel & Co. at Philadelphia on Monday, Feb. 14, began to take in Cambria Steel Co. stock at the agreed price of $81 per share, cash, at which terms the recent sale of the company to the Midvale Steel & Ordnance Co. was negotiated.

W. R. Cunnick has been transferred to the eastern district sales office of the Trumbull Steel Co., Grand Central Terminal building, New York City. Mr. Cunnick was formerly connected with the sales department of the company at Warren, O.

Conservatism

Reflected in Statement of Corporation's Unfilled Tonnage

Conservatism in placing new business upon the books, especially of the contract class, is reflected in the statement of unfilled tonnage of the United States Steel Corporation, as of Dec. 31, 1915, issued on Feb. 10. This shows an increase of 119,547 tons, compared with a gain of 616,731 tons in December, 1,024,037 tons in November, 847,834 tons in October and 409,163 tons in September. The unfilled orders on Jan. 31 were raised to 7,922,767 tons, or practically equal to the highest mark reached since the monthly statements have been issued, which was on Dec. 31, 1912, when a total of 7,932,164 tons was shown. At the close of the last quarter in 1906, the Steel Corporation had on hand booked orders of 8,489,718 tons and at the end of the first quarter of 1907, 8,043,858 tons, which made the record totals. A different method, however, was pursued in including subsidiary business than at the present time, so that the volume of orders at present may be considered to have reached practically the highest point in history.

February bookings have been proceeding on a larger scale than in January and, if these are mentioned, the statement as of Feb. 29, will show a larger gain.

The unfilled orders of the Steel Corporation at the close of each month since the monthly announcements were inaugurated, showing the changes in tonnage and per cents, are as follows:

Date.	Total.	Change, tonnage.	Change, per cent.
Jan. 31, 1916....	7,922,767	119,547+	1.53+
Dec. 31, 1915....	7,803,220	616,731+	8.58+
Nov. 30, 1915....	7,189,489	1,024,037+	16.63+
Oct. 31, 1915....	6,165,453	847,834	14.06+
Sept. 30, 1915....	5,317,618	409,163+	8.13+
Aug. 31, 1915....	4,908,455	20,085—	0.04—
July 31, 1915....	4,928,640	250,344+	5.35+
June 30, 1915....	4,678,196	413,598+	9.69+
May 31, 1915....	4,264,598	102,354+	2.46+
Apr. 30, 1915....	4,162,244	93,505—	2.21—
Mar. 31, 1915....	4,255,749	89,622—	2.06—
Feb. 28, 1915....	4,345,371	96,800+	2.28+
Jan. 31, 1915....	4,248,571	411,928+	10.74+
Dec. 31, 1914....	3,836,643	512,051+	15.40+
Nov. 30, 1914....	3,324,592	136,505—	3.94—
Oct. 31, 1914....	3,461,097	326,570—	8.62—
Sep. 30, 1914....	3,787,667	425,664—	10.01—
Aug. 31, 1914....	4,213,331	54,742+	1.32+
July 31, 1914....	4,158,589	125,732	3.12+
June 30, 1914....	4,032,857	34,697+	0.86+
May 31, 1914....	3,998,160	278,908—	6.98—
Apr. 30, 1914....	4,277,068	376,757—	8.09—
Mar. 31, 1914....	4,653,825	372,615—	7.42—
Feb. 28, 1914....	5,026,440	412,760+	8.95+
Jan. 31, 1914....	4,613,680	331,572+	7.74+
Dec. 31, 1913....	4,282,108	114,239—	2.59—
Nov. 30, 1913....	4,396,347	117,420—	2.60—
Oct. 31, 1913....	4,513,767	490,018—	9.79—
Sep. 30, 1913....	5,003,785	219,683—	4.24—
Aug. 31, 1913....	5,223,468	175,888—	3.03—
July 31, 1913....	5,399,356	407,965—	7.03—
June 30, 1913....	5,807,317	517,005—	8.18—
May 31, 1913....	6,324,322	654,440—	9.38—
Apr. 30, 1913....	6,978,762	490,194—	6.55—
Mar. 31, 1913....	7,468,956	187,758—	2.45—
Feb. 28, 1913....	7,656,714	170,654—	2.18—
Jan. 31, 1913....	7,827,368	104,796—	1.32—
Dec. 31, 1912....	7,932,164	79,281+	1.01+
Nov. 30, 1912....	7,852,883	258,502+	3.40+
Oct. 31, 1912....	7,594,381	1,042,874+	15.33+
Sep. 30, 1912....	6,551,507	388,132+	6.29+
Aug. 31, 1912....	6,163,375	206,296+	3.46+
July 31, 1912....	5,957,079	149,773+	2.58+
June 30, 1912....	5,807,346	56,363+	0.93+

Heavy Exports

For the Year Ending December—Active Importing of Scrap

The statistical report of the bureau of foreign and domestic commerce for December and for the year ending with December, 1915, shows that the exports for that month were slightly less than for November, while for the year the total was more than double that for the year ending December, 1914. The exports for December, 1915, were 353,836 tons, compared with 117,825 tons in December, 1914.

IRON AND STEEL EXPORTS, GROSS TONS.

	December, 1915.	December, 1914.	12 months end'g December, 1915.	12 months end'g December, 1914.
Scrap	16,276	1,511	79,361	33,134
Pig iron	21,807	6,746	224,499	114,423
Bil.. ingots & bl'ms of st'l.	49,912	3,430	560,728	50,496
Wire rods	13,458	7,435	165,010	61,855
Steel rails	40,831	3,567	391,491	174,680
Steel bars	49,606	22,002	425,995	123,006
Iron bars	3,975	384	39,725	5,226
Struc. iron and steel	18,920	10,758	232,937	182,395
Hoops, band and scroll.	3,006	706	29,325	9,954
Sh'ts & plates.	31,813	17,332	418,290	280,090
Tin & terne plates	16,971	3,977	154,538	59,548
Barbed wire.	26,175	8,332	248,615	93,843
All oth. wire	22,111	12,474	224,964	87,020
Cut nails	248	138	4,216	3,423
Wire nails	8,488	3,874	91,570	36,123
All oth. nails includ. tacks	1,083	307	9,269	3,183
Pipes & fit'gs.	23,144	11,669	176,884	199,618
R. R. spikes	2,630	168	13,294	6,914
Bolts, nuts, riv. and wash'rs	2,501	1,055	23,485	15,127
Horseshoes	544	1,688	15,863	5,903
Cast radiators	337	272	2,288	3,572
Total	353,836	117,825	3,532,347	1,549,533

The imports for December were 35,456 tons, compared with 37,131 tons in November and 9,493 tons in December, 1914. Importations of scrap represent more than half of the total last December, the figures being 20,666 tons for the month, as compared with 18,881 tons in November, 1915, and only 2,096 tons in December, 1914. The next largest item was pig iron, the tonnage being 11,620 last December, compared with 3,678 in December, 1914.

IRON AND STEEL IMPORTS, GROSS TONS.

	December, 1915.	December, 1914.	12 mths. end'g December, 1915.	12 mths. end'g December, 1914.
Scrap	20,666	2,096	79,982	34,849
Pig iron	11,620	3,678	89,836	139,683
Irgots, blooms, billets of steel	880	1,842	14,998	40,188
Wire rods	471	79	5,316	6,954
Rails	1,280	251	78,525	22,571
Bar iron	284	1,153	8,520	15,015
Structural	80	94	1,494	10,144
Sheets and plates.	113	69	1,420	4,310
Tin & terne plate.	62	231	2,350	15,411
Total	35,456	9,493	282,441	289,125

IRON ORE IMPORTS, GROSS TONS.

	December, 1915.	December, 1914.	12 mths. end'g December, 1915.	12 mths. end'g December, 1914.
Spain	3,146	.....	42,092	66,982
Sweden	6,446	.....	204,632	280,887
Canada	1,329	.....	84,124	52,514
Newfoundl'nd & Labrador	.....	.....	.....	38,515
Cuba	81,420	51,053	831,618	815,017
Oth. c'ntries.	25,980	.....	178,815	96,673
Total	118,321	51,053	1,341,281	1,350,588

The total value of imports of iron and steel and the manufactures of for December, 1915, was $1,835,250, compared with $1,510,678 in December, 1914, and for the 12 months of 1915 and 1914, respectively, $20,380,093 and $28,642,862. The total exportation of iron and steel produces was valued at $45,974,199 in December, 1915, and $14,939,613 in December, 1914, and for the year 1915, at $388,852,642, compared with $199,861,684 for the year 1914.

IMPORTS AND EXPORTS.

	Imports, gross tons.	Exports, gross tons.
January	10,569	139,788
February	7,505	144,363
March	8,025	174,311
April	16,564	223,236
May	28,917	262,306
June	32,201	355,396
July	20,858	378,890
August	27,556	405,850
September	23,345	381,914
October	34,730	351,039
November	37,131	362,764
December	35,456	353,836

In iron ore imports, the movement for the year was 1,341,281 tons, compared with 1,350,588 tons for the corresponding period ending December, 1914. For December, the iron ore imports were 118,321 tons, compared with 113,544 tons in November and 51,053 tons in December, 1914. The tonnage came largely from Cuba, from which 81,420 tons were imported in December, compared with 65,340 tons in November and 51,053 tons in December, 1914.

Some further information is now available in regard to exports for November. Exports of motor trucks continued to decline, the value for November being $3,837,307, compared with $4,307,190 in October. The value of aeroplanes exported in November was only $13,770, compared with $366,892 in October and $3,000 in November, 1914. Exports of metal-working machinery have increased. The total value of all machinery exports for November, 1915, was $15,838,119, compared with $6,204,927 in November, 1914, and $15,239,415 in October, 1915. In November, the total value of the exports of iron and steel and the manufacture thereof amounted to $48,056,220, and in November, 1914, the value was $15,689,401. Exports of zinc, except ore and dross, for November, 1915, were valued at $4,231,158, compared with $1,686,441 in November, 1914.

EXPORTS OF MACHINERY.

1915	Motor trucks.	Agricultural implements.	Aeroplanes.	Metal working machinery.
Jan.	$2,545,527	$429,745	$71,315	$2,903,740
Feb.	3,022,482	762,606	6,000	2,523,722
Mar.	4,725,563	1,567,327	89,450	3,863,913
Apr.	5,240,481	1,534,715	318,492	3,300,953
May	6,583,912	1,711,379	83,950	3,762,567
June	8,578,802	854,670	283,212	3,735,562
July	6,803,001	963,534	880,836	3,872,358
Aug.	4,387,193	1,454,606	588,600	3,624,411
Sept.	5,882,255	1,092,797	101,950	3,256,973
Oct.	4,307,190	791,230	366,892	3,236,079
Nov.	3,837,307	1,054,235	13,770	4,644,713

Takes Over Subsidiary

The capital stock of the Jos. Joseph & Bros. Co., Cincinnati, has been increased from $400,000 to $2,000,000, of which $1,500,000 is common and $500,000 preferred, all of which has been paid in. This was done to absorb the Railway Supply & Mfg. Co., which has been a subsidiary company and which has now been taken over and also to better facilitate the operation of the many plants of the Jos. Joseph & Bros. Co. throughout the country. The latter company has just completed a new office building containing 6,000 square feet of floor space, and a new scrap iron plant at Youngstown, O., which is now turning out about 500 tons of iron and steel scrap daily. The Jos. Joseph & Bros. Co. is now operating plants in the following cities: Cincinnati, Chicago Heights, Modena, Pa., Lebanon, Pa., Lackawanna, N. Y., Charlestown, Mass., and Youngstown, O., and storage plants in Williamsport, Pa., and Greenville, N. J. The company is not out at present for any special lot of equipment but is continually buying locomotive cranes and yard machinery.

Letting Contracts

New York, Feb. 15.—The Braden Copper Co., 120 Broadway, is letting contracts for the steel and machinery for improvements to be erected at its property at Rancagua, Chile, at a cost of approximately $10,000,000. The present capacity of this plant is 4,000 tons of ore a day and this will be increased to 10,000 tons daily.

The Port Henry Dock.—The ore dock to be built by Witherbee-Sherman & Co., Inc., at Port Henry, N. Y., will be constructed under the designs and supervision of Frank C. Roberts & Co., engineers, Philadelphia.

The Toledo Bridge & Crane Co. has built and is now ready to ship a double-leaf bridge to Chattanooga, Tenn. The span will be one-third larger in the clear than the Cherry street bridge, Toledo, 300 feet, and each lift weighs more than 1,300 tons. C. A. Peckham, vice president and general manager of the company, states that the concern now has enough orders booked to keep the organization busy until July.

Friends Honor Campbell at Dinner

Knowledge That Head of Youngstown Sheet & Tube Co. Would Remain in That City Arouses Notable Tributes From Associates

Youngstown, O., Feb. 15.—J. A. Campbell, president of the Youngstown Sheet & Tube Co., had the rare experience last week of receiving the congratulations of his most intimate associates upon the failure of a plan in which he was actively involved. The congratulations were more than perfunctory, being characterized by the warmth and intimacy that surround after-dinner remarks to a close circle of friends. The occasion was a banquet given on Thursday night in this city by Joseph G. Butler Jr. in Mr. Campbell's honor. The cause was the failure of the proposed merger involving the Youngstown company.

The dinner was more than a sincere and unaffected tribute to Mr. Campbell by his intimate associates. It served to unleash a flood of congratulations from his employes and the townspeople of Youngstown. In respect to his wishes, at that time unknown, little comment was indulged in prior to the breaking off of the merger, as it was felt that Mr. Campbell's past services to his employes and his broad-gaged interest in the municipal affairs of Youngstown entitled him to freedom from criticism. When Mr. Campbell, at the dinner, stated that he was glad to remain in Youngstown and to devote his entire time to the management of the Sheet & Tube Co., the pent-up feelings found spontaneous expression.

His employes, appreciative of the keen judgment and human sympathy that had brought about the rapid expansion of the company, coincident with like advances in the conditions of the workmen, were glad to continue under his personal management. Old mill hands who, through the knowledge that comes in years of association and service, had been aroused to an appreciation of his interest in their welfare, congratulated each other with the same warmth as the officials.

The prospect of Mr. Campbell's departure from Youngstown also had awakened the citizens of that municipality to a sharper appreciation of his wide-flung activities in civic affairs. His interest in this city had meant sacrifices in time and money, both of which had been freely given. A realization of the loss the city would suffer by his departure gave a deeper feeling to the pleasure shown by the citizens in the knowledge that he would remain.

Mr. Campbell occupied a place at the right hand of the host and grouped about the table were Samuel Mather, H. G. Dalton and Philip Wick, of Cleveland; with E. L. Ford, H. H. Stambaugh, L. J. Campbell, John Stambaugh, W. E. Manning, Henry M. Garlick, C. S. Robinson, A. E. Adams, W. B. Hall, John Tod, George E. Day and M. E. Dennison, of Youngstown. Letters of regret, all expressing warm sentiments for Mr. Campbell and satisfaction over his stand in the interest of his stockholders and the fact that he is to remain in Youngstown, were sent by Robert Bentley, Cecil D. Hine, J. L. Severance and Richard Garlick, who were unable to be present.

Addresses were made by all the guests in response to toasts offered by the host, Mr. Butler, who was elected a director of the Sheet & Tube company on July 26, 1904, at which time Mr. Campbell became president. These responses uniformly expressed pleasure over the outcome of the merger negotiations and were filled with a spirit of loyalty to and admiration for the Sheet & Tube company's president, together with congratulations for him and for the company and the city.

Regrets and Tributes

Samuel Mather said he attended the meeting held on Dec. 14 and that he was not in sympathy with the proposed consolidation, never had been and was glad that it had fallen through.

Edward L. Ford said he had attended what might have been a requiem on Dec. 14, and was glad to have Mr. Campbell back in Youngstown in full communion.

C. S. Robinson testified that the employes, and more particularly the heads of departments in the plant, were rejoicing over the falling through of the merger. Some of these men had been with the company from the time the first spade of earth was turned over.

Richard Garlick wrote: "I very much regret that I am unable to accept your invitation for dinner tomorrow evening, as I have an engagement of long standing which will take me out of town tonight. I am sure that all of your guests will appreciate this expression as much as Mr. Campbell. I feel that I have expressed my very high regard for Mr. Campbell in the most delicate way, that is, by selecting him as a neighbor from a long list of applicants, and I am more than sorry that I am obliged to express my fondness for you in the terms of the old adage that 'absence makes the heart grow fonder'."

Robert Bentley wrote: "I am sorry that I will not be able to accept your invitation in honor of our beloved citizen, Mr. Campbell. I would like to add my congratulations as to the collapse of 'our' merger and to express my satisfaction that the Youngstown Sheet & Tube Co. is to continue its independent and prosperous career under the leadership of its unequaled pilot, Mr. Campbell, and not be married off by that New York matrimonial board to Rebecca (as the *New York Times* puts it). Every one who will attend your dinner will continue to be proud of the Youngstown Sheet & Tube Co. and its president, and if I was there I would certainly advise Jim to build that house of his he has had so long on paper, settle down and sit on his own front porch with his bills receivable book in one hand and 'Baxter's Saints' Rest' in the other."

C. D. Hine wrote: "I very much regret that I cannot be present at the dinner to be given on the 10th inst. in honor of President Campbell, for there is no man of all my acquaintances whom it would give me greater delight to honor. After all, perhaps, it is just as well that I cannot be personally present on this occasion, as I might grow offensively enthusiastic."

John L. Severance sent his regrets, saying: "I would have considered it a great pleasure to show by my presence my appreciation of the high qualities of Mr. Campbell both as a man and as one endowed with unusual business acumen. I hold him in very high esteem and wish him the very best that this world has to offer."

Mr. Campbell gave a detailed account of the negotiations explaining the advantages that would have arisen from the combination of the ore and coal supplies owned by the different companies, balancing their source of raw materials. He also commented

upon the geographical location of the different plants, which would have enabled them to distribute their products in such a combination in the most economical manner. He stated that the rock upon which negotiations finally split was the fact that, in his opinion, it was unwise to form such a combination without the consent of at least 90 per cent of the stockholders in all of the constituent companies. This consent had not been secured in one of the corporations involved in the deal.

It was stated further to the representative of this publication that when Mr. Campbell first was urged to give this matter his attention, he was disinclined strongly to do so and said he felt his associates would not agree to consider it. But subsequently, owing to the fact that he had another invitation of a similar character from another financial interest here, he consented to co-operate with the strict understanding first, that everybody should be treated alike; second, that there should be no extensive promotion expense of any kind; and third, that any consolidation to be undertaken should be put through strictly on a conservative basis.

Mining Institute

Elects Officers and Discusses Technical Papers

New York, Feb. 16. — The opening session of the American Institute of Mining Engineers at the Engineering club this city, yesterday was distinguished by excellent attendance which continued to grow throughout the day. An extensive program of papers has been outlined for the session, a number of them being of special technical importance. Monday morning was devoted to consideration of papers on oil and gas, and Monday afternoon was given up to consideration of coal and coke. Yesterday's sessions were devoted to business and technical matters. All of Wednesday will be devoted to discussion of iron and steel subjects.

The election of officers today resulted unanimously in the following selections: President, Dr. L. D. Ricketts, New York City; vice presidents, Karl Eiler and James McNaughton; new directors, Thomas B. Stearns, Denver; Charles F. Rand, New York City; Charles W. Goodale, Butte; Edwin Ludlow, Landsford, Pa.; George D. Barron, New York City.

Hall & Paul, consulting engineers and chemists, recently have opened offices in the Empire building, Pittsburgh.

Ore Shippers

Pay Advance on Rate from Escanaba—Some Sales

Cleveland, Feb. 15.—A number of ore shippers have been active during the past few days in endeavoring to contract for vessel tonnage at advances in rates. A willingness has been expressed to contract for a long period at an advance in order to get vessel capacity for 1916 and there has been talk of contracting for five years at 65 cents from the head of the lakes, an advance of 15 cents over regular contract rates for 1916. In only one case, however, has an actual advance been made. A block of 40,000 tons has been placed under contract at 60 cents from Escanaba, an advance of 25 cents over the prevailing rate. While, of course, vessel men are anxious to get as much as they can for hauling ore, they realize that if ore-carrying rates are advanced too high, it will result in much more activity in the building of boats and eventually in greater competition for those now in commission.

There has been some selling of ore during the past week, largely to eastern consumers who cannot depend upon foreign supplies to meet their requirements this year.

Nuts, Bolts and Rivets

Pittsburgh, Feb. 15.—Rivets have been advanced $2 a ton in this district to 2.80c for structural and 2.90c for boiler rivets. It is likely that prices of nuts and bolts will be put up at an early date to meet higher prices of bars. Specifications for nuts, bolts and rivets are coming out in heavy volume and some tonnage is being shipped abroad.

Address on Molding Machines

A. O. Backert, vice president of the Penton Publishing Co. and secretary of the American Foundrymen's Association, will read a paper on "The History and Development of the Molding Machine With Sidelights on Latter-Day Practice", Feb. 21, at the monthly meeting of the Pittsburgh Foundrymen's Association. The meeting will follow a dinner at the Fort Pitt hotel, Pittsburgh. Mr. Backert will give a brief history of mechanical molding devices in foundry operations and will describe in detail the development of this practice. The various types of molding machines will be classified and a large number of lantern slides will be offered to assist in showing the application of molding machines to different classes of work.

Metal Markets

Spelter Shows Excitement — Copper Producers Selling Ahead

New York, Feb. 15.—With copper producers steadily selling their output farther ahead, it now is difficult to buy the metal for shipment prior to June; and such shipment may be had only in small quantities and at a premium. Electrolytic for February shipment, for instance, is selling around 29.50c, delivered 30 days, while the best brands of lake for March shipment are held at around 29.50c, cash. Electrolytic for June and July shipment is quoted at 27.50c, delivered 30 days, while on August and September about ¼c less can be done. On lake copper for May and June shipment quotations are as follows: Best brands 28c, cash; ordinary and arsenical grades, 27.50c, cash. Ordinary casting copper is held at 26.50c to 27c, cash.

The spelter market, which has been advancing slowly on a small but steady volume of business, today reflected great excitement as a result of an advance of £6 on spot and £3 on futures in London. There is a big inquiry in the market, both from domestic and foreign consumers and the market appears to be entering upon another buying period. The market on prime western is quoted as follows: Prompt, 20.75c to 21.00c, St. Louis; February, 20.50c; March, 20c; second quarter, 18.00c to 18.25c. Brass special for prompt shipment is held at 23.50c, St. Louis.

The lead market is exceedingly strong, following an advance by the American Smelting & Refining Co. to 6.25c, New York, and 6.17½c, St. Louis. The independent producers already have sold at premiums and the outside market is quoted at 6.25c to 6.30c, New York, and 6.17½c to 6.20c, St. Louis.

The tin market has been quiet during the week, but a large volume of business was transacted yesterday and today on advancing London prices. The market here is quoted: Spot, 42.50c; February, 42.25c; March, 42c, etc.

The supply of aluminum in the outside market again is exceedingly scarce, and higher prices have been paid. No. 1 ingots in carload lots are quoted at 58c to 60c, and sales have been made at the outside figure.

The antimony market is exceedingly well sold up on spot and the nearby futures, as shown by the fact that the leading far eastern producer has no more February and March shipment from China to offer. Last week the demand was active, and yesterday and today was less active but steady. Wah Chang's W. C. C. antimony is quoted as follows: Spot 44c to 45c, duty paid; April shipment from China, 33.25c to 33.50c, in bond at New York. Other Chinese and Japanese brands are quoted at 44c, duty paid, for spot, and domestic antimony for spot delivery is held at 43.50c, New York.

Arthur Cobberroth has been made head of the cost department of the Bethlehem Steel Co., succeeding H. E. Lewis, who recently was promoted to be assistant to President E. G. Grace.

In appreciation, Mr. Lewis, upon his retirement from his former position, was presented with a silver loving-cup, by the employes of the department of which he had charge.

Metallography of U. S. Navy Steel

AS A STEP towards "preparedness", American manufacturers should acquaint themselves with the government requirements for naval ordnance. The upbuilding of the navy will mean the consumption of large tonnages of steel, and the following explanation of our ordnance specifications is therefore of value

BY HAROLD EARLE COOK, Lieut.-Com., U. S. N.

THE purpose of this paper is to state briefly the inspection requirements of the bureau of ordnance, the specifications governing the inspection, and the physical and chemical properties of the steel used in the construction of ordnance for the United States navy. It would be of interest to evoke discussion on points in these specifications which do not tend to insure the production of the very best material for the purpose intended. In other words, what requirements of our specifications are useless and also in what manner are our specifications deficient?

It might be well at the start to answer the first criticism which will probably be made of this paper, and that is that the title does not agree with the subject matter. Considering metallographic work as covering only the macroscopic and microscopic examination of metals, this paper will have gone beyond the subject; but it is believed that a broader definition of metallography is that it is the study of the relation of the internal structure of metals and alloys to their composition and to their physical and other properties.

The internal structure of steel is dependent on its physical and its chemical properties. These physical properties are dependent on the chemical composition and the mechanical and thermal treatment of the steel. So it seems that this subtitle would not be entirely necessary and that the title "Metallography of Steel for Ordnance Purposes" would cover a study, not only of what we can learn of macroscopic and microscopic examination, but broadly of the whole subject of the specifications, the fulfillment of the requirements of which produce the structural conditions revealed by macroscopic and microscopic examination.

I will refer but briefly at the beginning to the microscope and its uses in our inspection. It is only very recently that the bureau of ordnance has furnished certain of its inspection offices with a portable Tassin outfit for the microscopic examination of steel. Since that time, the offices thus supplied have been studying the subject, and making considerable progress in order to keep up with the development of the art, so that when it reaches the state of development whereby it may be used to definite purpose in inspection, the various inspection offices will be equipped and prepared.

With the exception of our specifications for gun forgings there are no ordnance specifications at the present time which make reference to metallographic examination, as it may be said that defects which might be developed by routine microscopic examination would certainly be developed in the course of ordinary tests and inspections. Our specifications for gun forgings say: "The department reserves the right to make such microscopic examination as it may deem necessary." The use of the micro-

Presented at the New York meeting of the American Institute of Mining Engineers, Feb. 16. The author, Harold Earle Cook, lieutenant-commander U. S. navy, is naval inspector of ordnance at the works of the Midvale Steel Co.

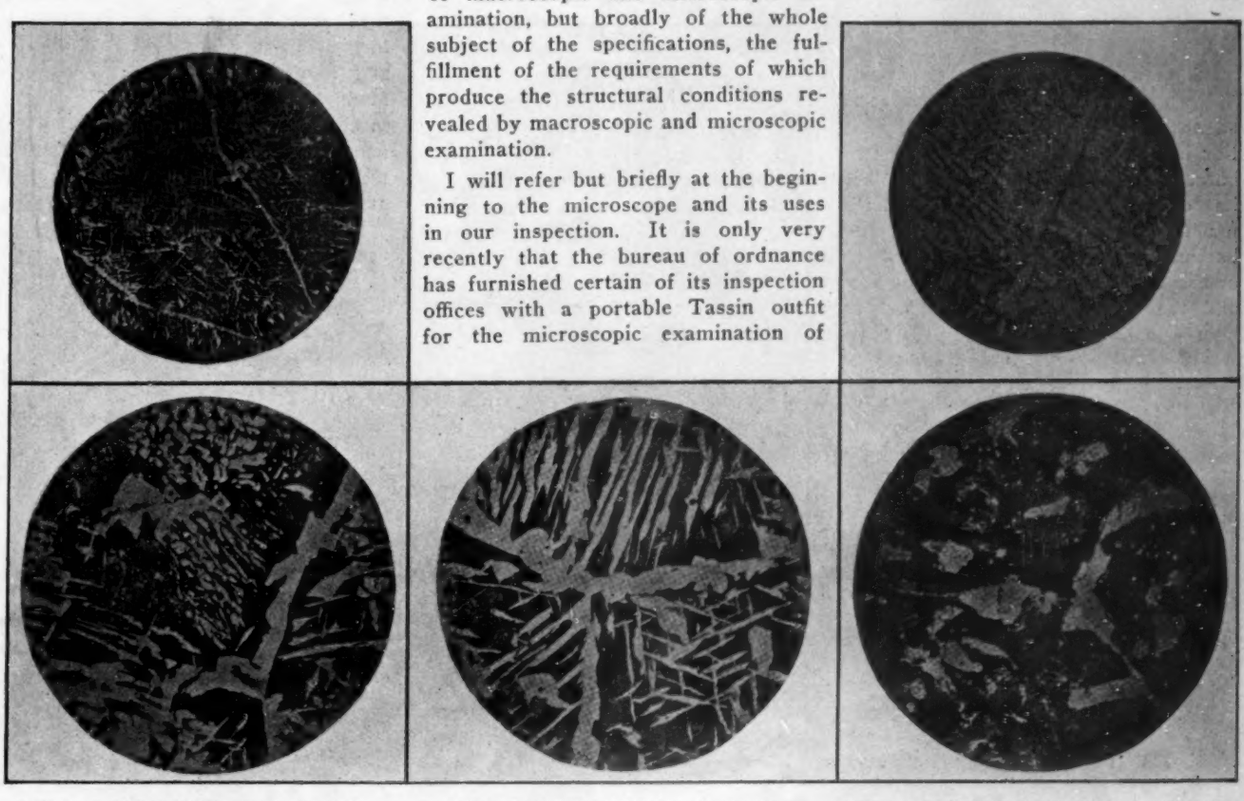


FIG. 1—INGOT STEEL AS CAST
Magnification 21.

FIG. 2—INGOT STEEL AS CAST
C, 0.28 per cent. Magnification 68.

FIG. 3—INGOT STEEL AS CAST
C, 0.28 per cent. Magnification 68.

FIG. 4—STEEL ORDNANCE CASTING
Magnification 21.

FIG. 5—3.5 PER CENT NICKEL-STEEL
Magnification 68.

FIG. 6—STEEL CASTING FOR ORDNANCE MAKING
Magnification 80.

FIG. 7—STEEL ORDNANCE CASTING
Magnification 21.

scope will be referred to in discussing the various specifications.

A few years ago each of the bureaus under the navy department had its own specifications for the different classes of material required by it. For instance, as to steel forgings, the bureau of construction and repair had its own specifications for material for forgings for hull material; the bureau of steam engineering had its own specifications for engine forgings; and the bureau of ordnance had its own specifications covering forgings

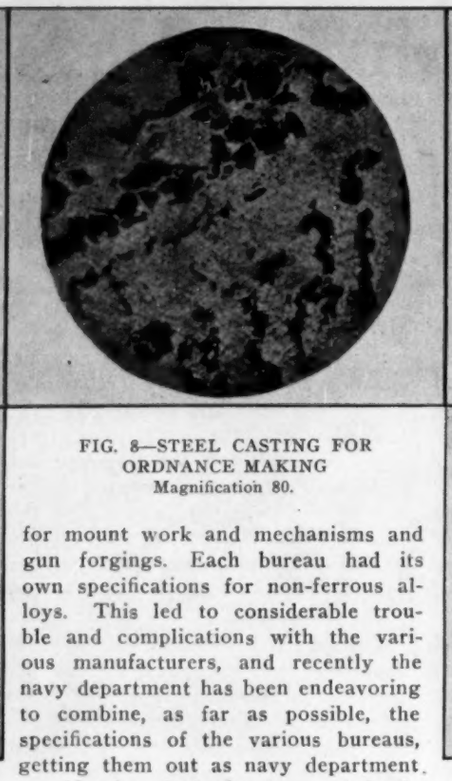


FIG. 8—STEEL CASTING FOR ORDNANCE MAKING
Magnification 80.

for mount work and mechanisms and gun forgings. Each bureau had its own specifications for non-ferrous alloys. This led to considerable trouble and complications with the various manufacturers, and recently the navy department has been endeavoring to combine, as far as possible, the specifications of the various bureaus, getting them out as navy department specifications in leaflet form. A booklet of general specifications is issued giving the requirements common to all material, method of testing and instructions to inspectors, which forms a part of each individual specification.

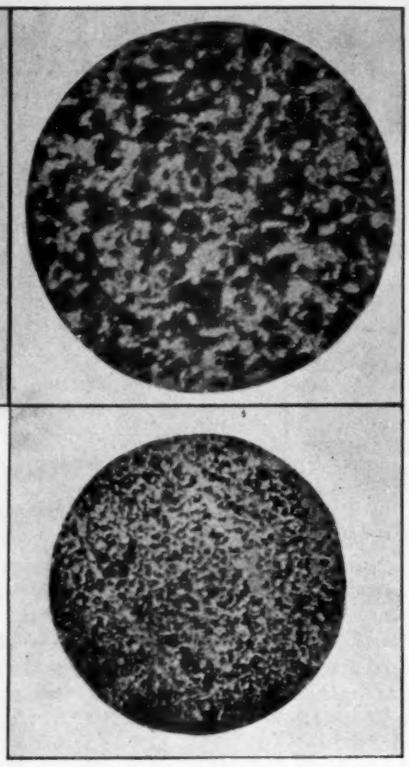


FIG. 9—NICKEL-STEEL CASTING
0.30 per cent carbon, 3.5 per cent nickel and 0.2 per cent chromium. Magnification 80.

FIG. 10—STEEL CASTING
Magnification 32.

These specifications are now used by the bureau of ordnance for ordinary forgings and castings, both of steel and non-ferrous material for use in mount work, small parts of breech mechanisms and miscellaneous ordnance work. But for the more important ordnance material it is still necessary to issue separate and detailed specifications. Thus, there are separate detailed specifications for armor, projectiles, gun forgings and torpedo air flasks, heads and other equipment. The specifications for armor are is-

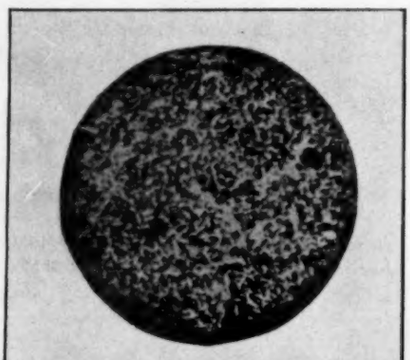


FIG. 11—NICKEL-STEEL CASTING
0.30 per cent carbon, 3.5 per cent nickel and 0.2 per cent chromium. Magnification 80.

FIG. 12—STEEL CASTING
Magnification 32.

FIG. 13—STEEL CASTING
Magnification 80.

FIG. 14—STEEL CASTING AFTER HEAT TREATMENT
Magnification 80.

FIG. 15—STRUCTURE OF TEST SPECIMEN
Magnification 80.

FIG. 16—STRUCTURE OF TEST SPECIMEN
Magnification 80.

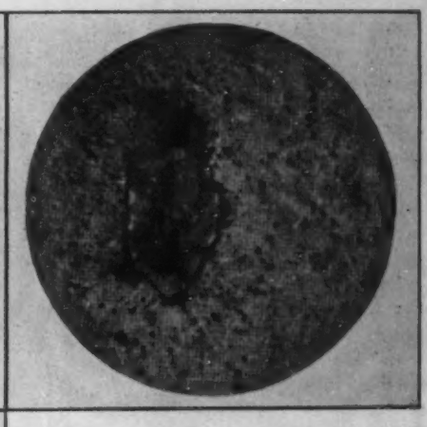


FIG. 18—MICROSCOPIC INCLUSION IN NICKEL-STEEL CASTING
0.30 per cent carbon. Magnification 80.

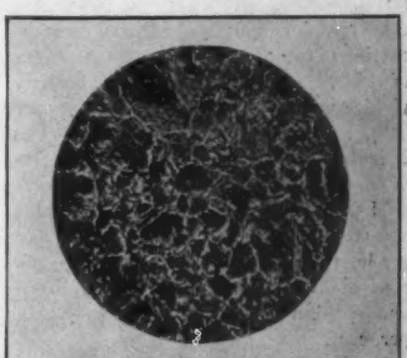
sued in booklet form prior to the award of each armor contract. The details of these specifications are confidential.

The manufacturer is required to furnish the bureau's inspector with reports of chemical analyses, etc., and the required amount of discard and forging reduction, as specified.

The protective armor for each battleship is divided into groups of from 500 to 600 tons, which means 10 to 20 plates, depending on their size and thickness. As each armor plate in a group receives its final treatment, physical-test specimens are taken to show the properties of the plate, analyses are furnished and other physical data; and when the last plate of a group receives its treatment, one of the plates is selected for ballistic test. This plate is sent to the naval proving ground at Indian Head, Md., and subjected to a ballistic test, being required to withstand the impact of a certain number of projectiles at given velocities.

The microscope plays no part in the inspection of armor, but this office has been making examination, for purposes of study, of fragments of armor plate, and it is believed that some day information gained by the use of the microscope may prove of value, in the manufacture of armor. Specifications for the inspection of

FIG. 17—STRUCTURE OF NICKEL-STEEL CASTING
0.30 per cent carbon, 2 per cent nickel. Magnification 80.



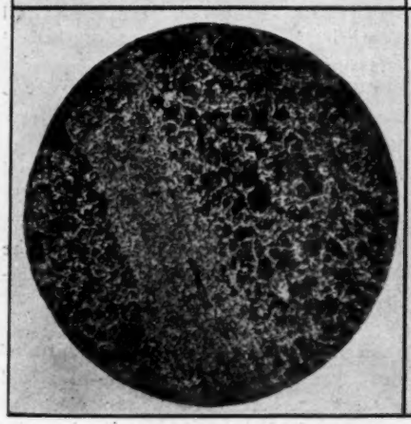


FIG. 19—GUN FORGING
Annealed, quenched and drawn. Carbon 0.30 per cent, nickel 3 per cent. Microstructure of test specimen at breech end. Magnification 80.

FIG. 20—TYPICAL STREAK IN STEEL CASTING
0.40 per cent carbon. Magnification 80.

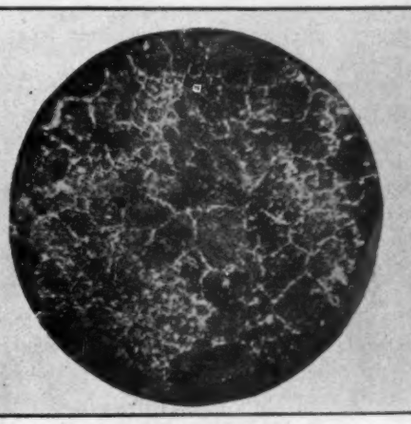


FIG. 21—CHARACTERISTIC STRUCTURE OF STREAKS IN STEEL CASTING
0.42 per cent carbon.

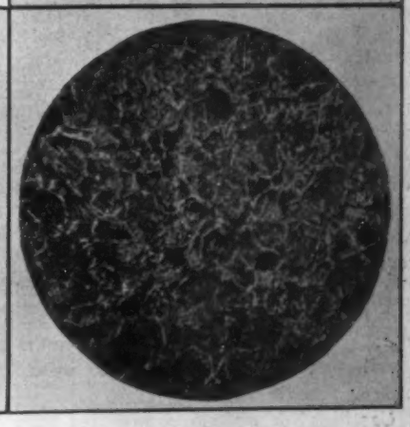


FIG. 22—GUN FORGING
Annealed, quenched and drawn. Carbon 0.30 per cent, nickel 3 per cent. Microstructure of test specimen at breach end. Magnification 80.

FIG. 23—CARBON 0.40 PER CENT, NICKEL 2 PER CENT
Annealed, quenched, drawn. Structure consisting of a net work of ferrite and sorbite as shown

armor-piercing projectiles are also held confidential. As each lot of armor-piercing projectiles, when completed, is subjected to a ballistic test, a certain number of projectiles being selected from the lot for this purpose, great latitude is allowed the manufacturer as to the method of manufacture, discard, composition, etc.; but to promote uniformity in the lot, a maximum and minimum variation from the average of each of the important alloys used is prescribed. Physical tests are prescribed for the material used in the base plug of the shell, and also for the copper rotating band. Though it is believed that metallographic examination is of the greatest value to the manufacturer of armor-piercing projectiles, it is not thought that it will ever be of any practical value for inspection purposes, as the ballistic tests are such as to insure the excellence of a lot of projectiles which successfully endure the test. In the manufacture of both armor and projectiles, every operation is open to the inspector, who is a commissioned officer.

Navy specifications for steel castings give requirements for six different grades. Of these, two grades in particular are used for ordnance material. Grade F, which is used for castings for gun yokes and special castings, must show a tensile strength of 85,000 pounds per square inch, a yield point of 53,000 pounds per square inch, with 22 per cent elongation in 2 inches, and 30 per cent reduction of area. A bending test must give a 120-degree bend about a 1-inch diameter. It is required that this grade contain from 3.25 to 3.75 per cent of nickel and that the phosphorus and sulphur content be not over 0.05 per cent.

Grade B is utilized for most ordinary castings and for those of great size. Its physical and chemical requirements are a maximum tensile strength of 80,000 and a minimum of 60,000 pounds, with a yield point equal to 45 per cent of the tensile strength obtained; elongation in 2 inches, 22 per cent, and reduction of area, 25 per cent. The same bending test is required as for grade F, and the phosphorus must not be over 0.06 nor the sulphur in excess of 0.05 per cent. The maximum and minimum tensile-test requirements are to insure proper machineability.

Castings for ordnance purposes vary from those of the very smallest size to massive castings, such, for example, as a slide for a 14-inch gun mount, in which the complete casting, before its machining, weighs about 17 tons. The specifications require that coupons from which test specimens are to be taken, whenever practicable, be cast on the body of the casting, and that, when this is not practicable, the coupon shall be cast with, or gated to, the casting, or with runners to the gate. The inspector's approval must be obtained in all cases, and the number of tests taken must be such as to exhibit thoroughly the uniform quality of the casting.

It has been my experience that tests taken from coupons gated to a casting are not indicative of the true condition of the body of the casting. The solidification of the metal may not be under the same conditions. The coupon would freeze more rapidly than the greater mass of metal. The segregation of the constituents would not be the same. The treatment effect might be quite different, especially if

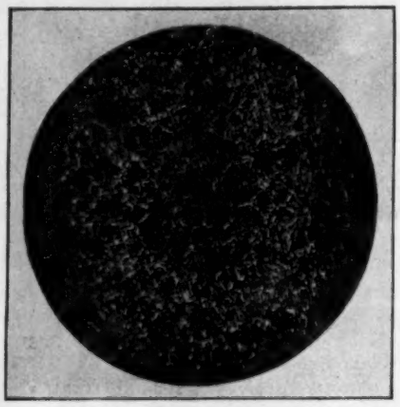


FIG. 24—GUN FORGING

Annealed, quenched and drawn. Carbon 0.30 per cent, nickel 3 per cent. Specimens shown in Figs. 19, 22, 24 and 25 met requirements of test: tensile strength 90,000; yield point, 60,000; elongation in 2 inches, 18; reduction in area, 30. Fig. 24 gave best results, Figs. 19 and 24 gave highest percentage reduction of area.

the requirements laid down for treatment in specifications, which will be discussed later, were permitted to be departed from. I believe that it would be much more desirable, where possible, to machine the test specimens from desired points in the body of the casting, but of course this procedure would be objected to strongly as increasing the expense.

With castings so small as to render it impracticable to cast coupons on the body of the casting, and where a number are made from the same heat and treated together, I believe that the preferable method of test is to require a sufficient extra number of castings to be made from each heat and to select at random several to be cut up for test. To cast, as is sometimes done, a coupon for test separate from the intricate-shaped castings, and to test it to pass upon a lot, or to test representatively, castings differing in shape and size, gives, to my mind, a false indication of the condition of the castings themselves.

In the larger castings, it is the custom to cast coupons for test at various points on the cope and drag side of the casting, about 2 x 4 x 8 inches in size. On the castings as supplied to the naval gun factory, coupons of this size form a portion of the pattern. These are cast so that the 4 x 8-inch area is fixed to the body of the casting, and they are used if, at any time after delivery, it be considered advisable to take additional tests from the castings.

As to the relative value of tests from coupons I will cite an example. A manufacturer of some large, heavy castings, used coupons of approximately the size above named, but with the narrow edge of the coupon continuous to the body of the casting so that the coupon could be easily knocked off, avoiding machining. Test specimens from these coupons gave satisfactory physical values and the castings were provisionally accepted.

After delivery at the gun factory, additional tests were taken from some flat coupons which were machined off the castings; and so marked a difference was noted, both in all the physical properties and in the microstructure, as to preclude the use of these castings for the purpose intended. A number of them were re-treated and subsequently accepted on tests taken out of the body of the casting as furnished. It was with great difficulty that the requirements were met.

An examination of the microstructure exhibited in the various test bars showed a wide variation in structure. The structures were nearly all pearlitic, but those from the original coupons showed a grain refinement not exhibited in the body of the casting at that time; and the pearlite was in a different state. These castings had been treated in a rather crowded casting pit, and it is thought that the coupons on edge, projecting out from the body, were more affected by the heat and that their rate of both heating and cooling differed from that of the rest of the casting. And further, it is possible that the loss of heat by radiation from the exposed surfaces of the coupon exceeded the rate at which it could receive heat by conduction in cooling from the body of the casting. It is also probable that the furnace heat was insufficient to cause the body of the casting to reach the desired heat for proper treatment. In castings whose shape and

size would permit air or oil quenching, it is believed that the difference which I have noted would be very much more marked.

The specifications include a clause on treatment, in which it is specified that castings to be annealed shall be held at the temperature of annealing long enough to insure that the interiors of the castings have been brought to that temperature. After the castings have been soaked at the proper annealing temperature, they must be allowed to cool slowly in the furnace, carefully protected from drafts or air. Unless otherwise directed by the inspector, castings must not be removed from the furnace until they have been cooled down to the temperature at which the color dies. Under no circumstances will the manufacturer be allowed to use water, brine, oil or air-blast to hasten the cooling process, without the approval of the inspector. The number of hours requisite for raising the castings to the proper temperature, the length of time during which they should be soaked at that temperature, and the period required for slow cooling in the furnace, or in the air, may be prescribed by the bureau concerned if it so desires.

Large castings are generally considered a cheap product in comparison with forgings, and appear never to have received the consideration as to scientific treatment and endeavor to give them a good structure, that is bestowed upon high-grade forgings. It appears to be only quite recently that casting plants have begun to install pyrometric control for regulation of temperature. It appears to be still a disputed question, whether a casting could ever be put in as good a condition as a forging. It is my belief that the most scientific treatment would fail to render a casting the equal of a forging as carefully made and treated. I believe that the primary ingot crystallization can be completely destroyed only by means of mechanical working, or, if this theory is not correct, that the different structural conditions developed in the body of a massive casting in the ingot state, cannot be brought to a uniform condition by thermal treatment.

I am conducting, in a small way, some experiments with specimens of castings. I was first directed to this opinion by the fact that in numerous specimens examined microscopically, broad ferrite bands were noted from time to time extending across the field of the microscope, which did not appear to be in the nature of the usual "ghost lines" formed. It has occurred to me that the primary crystallization of the ingot which has crystals so large that they are often noted by the eye without magnification, or noted in macroscopic examination, are never completely destroyed. Heat treatment may dissolve the ferrite from the boundaries to such an extent that they are completely masked and cannot be seen by the microscope, or even if they are, the primary crystals may be so large that the usual field of magnification is contained in one large cell. This theory, of course, is not a new one, and has been the subject of discussion, the majority of authorities appearing to disbelieve it.

There are certain points open to discussion which I will touch upon, but inasmuch as the treatment is largely left to the approval of the

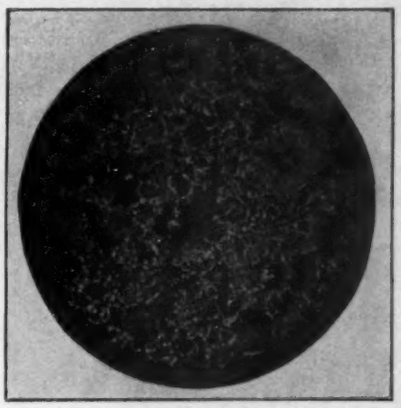


FIG. 25—TEST SPECIMEN OF GUN FORGING AT MUZZLE END

inspector, when a different logical treatment is desired for physical properties, his approval could be obtained. For instance, the temperature of 1,500 degrees prescribed, would manifestly give poor results if but a single treatment were attempted, as prescribed, with a grade F casting containing a rather high percentage of nickel and possibly of carbon, since long exposure at a temperature considerably above the upper critical would result in a large grain size. Many of the castings, specimens of which I have examined, show clearly the effect of this treatment.

In some cases large castings are placed in pits, heated up to a somewhat uncertain temperature, and held at times for as long as a day, and then cooled slowly in the furnace for an equal or longer time. The long exposure at high temperature is considered necessary to insure the soaking of the casting, but it certainly also insures a grain growth, provided the critical temperature has been exceeded. The extremely slow cooling through the critical range allows the rejection in totality of the ferrite, and in the low-carbon castings it often resolves itself into extremely large ferrite grains with large isolated pearlite patches in the grain boundaries. It seems remarkable that physical tests from such castings give the results that they do, generally meeting the requirements. It is believed that impact or vibratory tests on this material would develop deficiencies in comparison with more scientifically treated material.

Some castings which have received a double annealing treatment have exhibited excellent results. It is believed that if greater care were exhibited in the heat treatment of castings to insure heating them and holding them at just about the upper critical, taking into careful consideration the chemical composition, and cooling them at such a rate through the critical range as will give the most desirable properties, physical properties vastly superior to those at present obtained, would be the result.

I will now give some examples of the microstructure found in various ordnance castings. The specimens examined are prepared by sawing off the test specimens transversely in the threads and polishing and etching by the usual methods.

Figs. 1, 2, 3 and 5 show the structure of a class B casting in the green, as cast, and before any heat treatment. Fig. 1 shows a complete ingot crystal at a low magnification (21). Fig. 5 shows the structure of a casting containing 3.5 per cent nickel.

Figs. 4, 6, 7 and 8 are reproductions of photographs taken from physical test specimens from a class B ordnance casting weighing about 500 pounds. This casting was accepted on the test specimen, which showed a tensile strength of 73,500 pounds, a yield point of 44,500 pounds, with 24 per cent elongation in 2 inches, and 38.7 per cent reduction of area. It was a simple steel casting of about 0.24 carbon which had received an annealing treatment from a temperature supposed to be just above its critical range. Figs. 6 and 8 show the structure at 80 magnification. The totality of the ferrite appears to have been rejected, and the pearlite under high magnification shows the normal laminated structure. Figs. 4 and 7 show the same structure at a magnification of about 21, including a greater area in the field. It will be seen that the structure resembles very closely an ingot structure which has apparently not been broken up by the treatment. It is thought that the treatment temperature was probably less than re-

ported, and was not high enough or sustained long enough to break up completely the original structure. It seems remarkable that such satisfactory physical results should have been obtained.

Figs. 9 and 11 show two specimens taken from 0.30 carbon, nickel-steel castings which contained between 3.25 and 3.5 per cent nickel and about 0.2 per cent chromium. These castings received a double annealing treatment and showed from 93,000 to 102,000 pounds tensile strength with a yield point of from 61,000 to 64,000 pounds, with 22 per cent elongation and 38 to 40 per cent reduction of area. In the structure of these castings it appears that the alloys have caused a part of the ferrite to be retained in solution, as the dark areas are not pure pearlite, appearing to be in the transitory stage with some sorbite.

Figs. 10, 12, 13 and 14 show a structure taken from another physical test specimen of practically the same composition, which gave a tensile strength of 91,000 pounds, a yield point of 64,000 pounds, elongation of 23 per cent and reduction of area of 41 per cent. In this case there appears to be a greater amount of ferrite and its segregation appears in the nature of a ghost. The pearlitic structure is not characteristic, as the pearlite grains are so small. Fig. 13 shows the structure at a magnification of 80, and Figs 10 and 12 at 32. The ghost lines are most prominent in the lower magnification. Fig. 14 shows the same specimen after it had been heat treated in a small furnace. It was heated in one hour to a temperature of 1,500 degrees Fahr, held at this temperature for one-half hour and cooled in the furnace in two hours. The ghostline structure seems to have disappeared, and the ferrite is more evenly distributed. It is not known, of course, what physical properties would be exhibited by such a structure.

Fig. 15 shows the structure exhibited by a test specimen of a class B casting, which passed the physical test, giving the following results: Tensile strength, 70,500 pounds; yield point, 36,000 pounds; elongation, 27.5 per cent; and contraction, 49.2 per cent. This was a 0.26 carbon, simple steel casting and had been held at a temperature supposed to be 1,650 degrees Fahr. for 22 hours and cooled for 17 hours. It presents the characteristic structure of an ingot, which is noticeable by comparison with Figs. 1, 2, 3 and 5. It is not understood how such good results were obtained in elongation and reduction of area with such a poor micro-structure. Fig. 16 shows a similar casting which gave similar results. The upper critical temperature was probably never reached in the treatment of these castings. Fig. 17 shows the structure of a 0.30 carbon, nickel-steel casting containing about 2 per cent of nickel. The physical results shown were: Tensile strength, 89,000 pounds; yield point, 54,500 pounds; elongation, 18 per cent; and contraction of area, 29.2 per cent. Long heating in a single treatment, and slow cooling, evidently caused the ferrite to collect in large grains.

From the very poor structure exhibited in the examination of numerous ordnance castings, I believe that great progress will be made in future in the development of more satisfactory and uniform castings through more scientific heat treatment. Probably at the present time the specification requirements are not too severe, so that with well-melted steel the fulfillment of the requirements is not a difficult matter. Castings received and finally accepted for installation in the manufacture of ordnance, appear to be highly suitable for the purpose intended. It does not appear to be advisable to incorporate requirements which would compel the manufacturer to install expensive equipments for more scientific treatment, thereby increasing the cost. But a special grade might be added to the specifications which would cover these points.

At present the greatest difficulty in the development of ordnance castings appears to be the prevention of blowholes, segregations and shrinkage defects.

As regards the microstructure noted in the examination of ordnance castings, it may be said in general that a pearlite structure is exhibited; that when an alloy steel is used, the totality of the free ferrite is not rejected and there is a predominance of the darker areas. The usual impurities are noted throughout the structure always in the form of rounded areas, the slate-colored impurities being silicate of manganese, whereas the manganese sulphide has the characteristic dove color.

Before taking up the more important question of forgings for ordnance purposes, it may be of interest to remark that while the bureaus of steam engineering, and construction and repair have chemical laboratories, where analyses are made of drillings taken from castings and forgings by their inspectors, the results to be passed on before acceptance, the bureau of ordnance has not. A copy of all analyses taken by the manufacturers is always required, and this has been considered sufficient. Check samples have been taken from time to time, and in cases of doubt, and sent to the nearest government chemist for analysis. The results have not seemed to warrant making our own analyses of all material. This course is probably rendered doubly safe by the fact that nearly all ordnance material of importance is subjected to a ballistic test of some nature before final acceptance, and much latitude is therefore allowed the manufacturer in the chemical composition used.

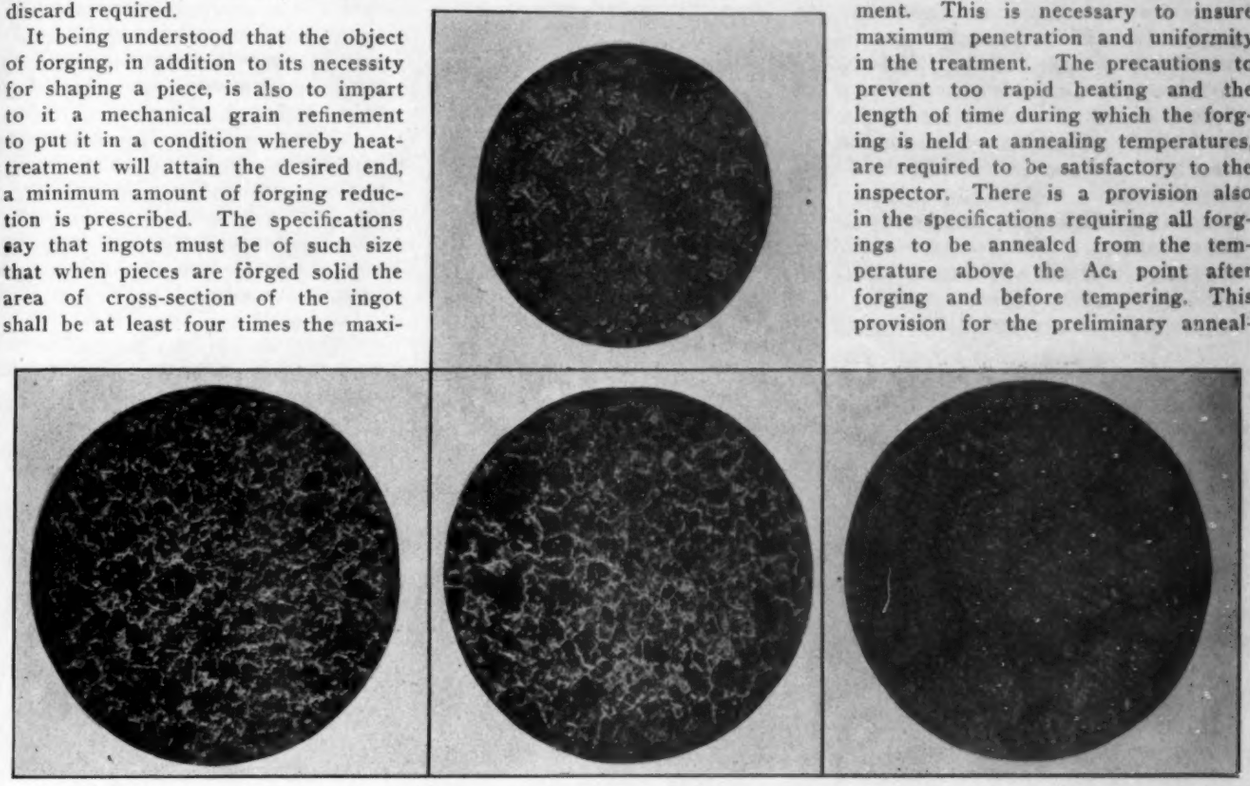
The specifications for steel and alloy-steel gun forgings, except for a few very minor details, are the same for both the army and the navy. They are issued in the form of a pamphlet, revised from time to time, which goes into the requirements for manufacture and inspection in considerable detail. The manufacturer is required to furnish reports of all analyses and physical tests made by him during the manufacture. He is required to furnish reports in advance of each operation in the manufacture in order that any operation desired may be witnessed. The government stamp is placed on each forging, transferred if necessary, and carried through to completion.

The term "gun steel" is defined as a simple carbon steel, and the term "alloy steel" as a simple carbon steel with such percentage of alloy added as is necessary to obtain the required physical qualities. Thus, if the required physical qualities could be obtained with a simple carbon steel, the manufacturer would be at liberty to use it, and the question has been considered from time to time of specifying a minimum allowable percentage of nickel in alloy steel, in order to impart certain desired properties and to prevent a too rigid heat-treatment to obtain the required properties. At present the only definite requirements as to composition are that the allowed percentage of sulphur and phosphorus shall not exceed 0.05. In examination of the microstructure of gun forgings, sulphur is usually seen in the form of manganese sulphide, which will be discussed later, and phosphorus segregations have been suspected in certain light-colored areas which have been brought out by the use of Rosenhain's reagent.

The specifications require that from open-mold ingots the discard from the top shall be at least 30 per cent of the total weight of the ingot, and from the bottom at least 5 per cent. Possibly it would be better if the specifications did not prescribe a definite amount of discard but required the

discard in each case to be sufficient to obviate any chance of piping or marked segregations. It is my opinion that 5 per cent discard from the bottom of large ingots is an insufficient amount, but as this would be developed in the testing, the amount in excess of 5 per cent should be left to the discretion of the manufacturer. From fluid-compressed ingots there is a slight reduction in the amount of discard required.

It being understood that the object of forging, in addition to its necessity for shaping a piece, is also to impart to it a mechanical grain refinement to put it in a condition whereby heat-treatment will attain the desired end, a minimum amount of forging reduction is prescribed. The specifications say that ingots must be of such size that when pieces are forged solid the area of cross-section of the ingot shall be at least four times the maximum area of cross-section of the rough forging, and when bored ingots are used, the wall thickness of the ingot must be reduced by forging 50 per cent. Some forgings are of such a size that it would not be possible to make them from the largest ingot and give them the amount of reduction prescribed by the specifications. Other forgings are of different size at each end, and the shaping of them of necessity requires a different amount of forging reduction. In many such cases it is necessary, in the process of manufacture, that the ingot, after being punched or bored, be upset a certain amount, and in other cases forgings are drawn out and then enlarged on a bar. In all such cases a record is made of the total amount the metal has been worked. In other words, the upsetting operation is also considered as a forging reduction, although it is not, of course, in strict accordance with the wording of the specifications. It must be recognized that the amount of forging reduction alone will not insure a mechanical grain refinement, and that the temperature at which the forging is completed, and the subsequent treatment of the forging, play a most important part. If the forging is stopped at too high a temperature and the metal allowed to cool slowly, there will, of course, be a grain growth, and in large masses of metal this cannot be entirely prevented, as the metal cannot be worked entirely down to the critical range; but this is taken care of in the requirements under "Heat-Treatment". Physical tests and metallographic inspection of the ends of forgings which have had a different forging-reduction at each end, have not shown any marked difference attributable to the amount of reduction. Most long forgings will show the best physical results in specimens parallel to their axes, and short hoops enlarged on a bar transversely. But most forgings which are worked in more than one direction mechanically, show little difference between transverse and radial or longitudinal bars. The specimens for treatment require that the manufacturer keep a record and furnish copies of it to the inspector, showing the length of time for heating, the time held at that temperature and the time of cooling of every operation in thermal treatment. It is also required that he have an accurate means of ascertaining the temperature used. It is also required that, when practicable, forgings must be rough machined before treatment. This is necessary to insure maximum penetration and uniformity in the treatment. The precautions to prevent too rapid heating and the length of time during which the forging is held at annealing temperatures, are required to be satisfactory to the inspector. There is a provision also in the specifications requiring all forgings to be annealed from the temperature above the Ac_1 point after forging and before tempering. This provision for the preliminary annealing covers the point referred to above, but it is believed that the Ac_3 critical point should be prescribed in place of the Ac_1 to insure better results.



CHARACTERISTIC MICROSTRUCTURES FOUND IN NICKEL STEEL FOR GUNS—ANNEALED, QUENCHED AND DRAWN
Fig. 26—(At left) Nickel steel. Carbon, 0.40 per cent; tensile strength, 95,000; yield point, 62,000; elongation in 2 inches, 24; reduction in area, 50. Magnification, 80. Fig. 27—(Above) Small nickel-chrome gun forging. Carbon 0.40 per cent. Tensile strength, 104,000; yield point, 68,000; elongation in 2 inches, 22.9; reduction in area, 58. Magnification, 82. Fig. 28—(Center) Nickel steel. Carbon, 0.40 per cent. Tensile strength, 112,000; yield point, 70,000; elongation in 2 inches, 21; reduction in area, 48. Magnification, 80. Fig. 29—(At right) Rare smaller forging. Tensile strength, 105,000; yield point, 63,000; elongation in 2 inches, 25; reduction in area, 54. Magnification, 155

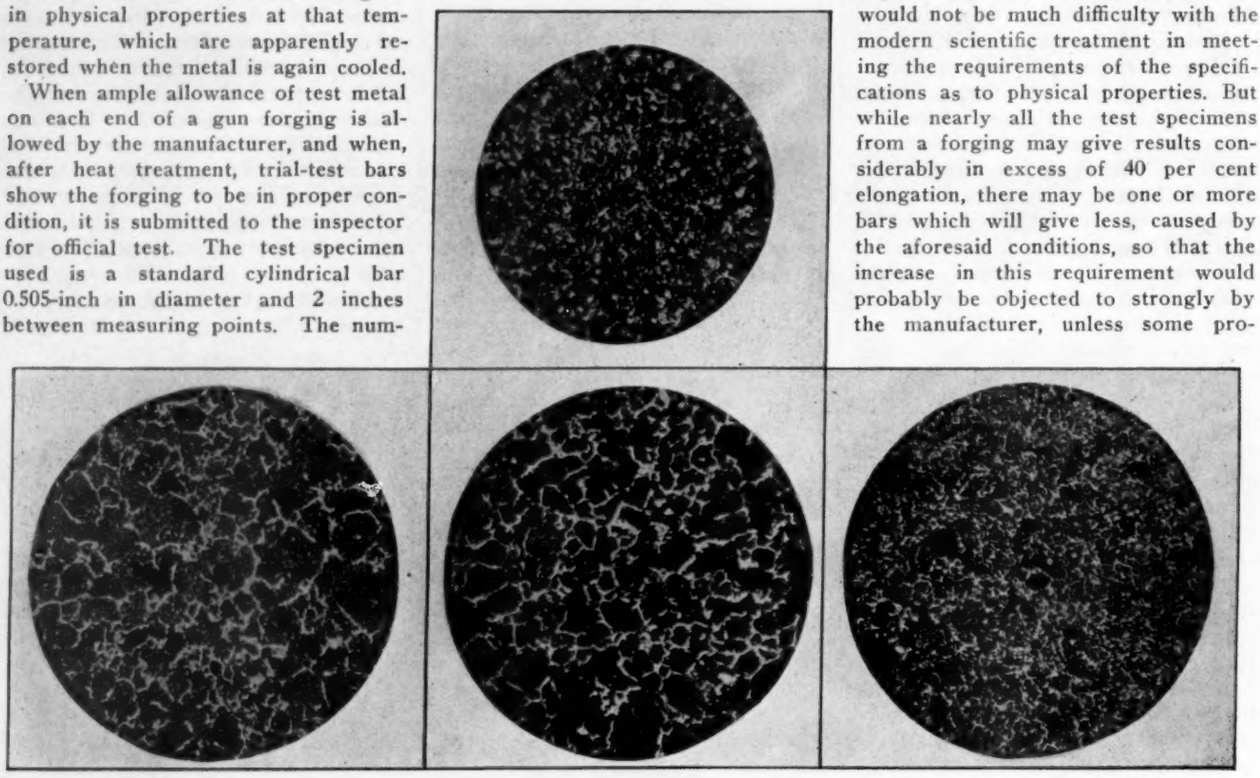
It is required that all gun forgings of length be heated for quenching in vertical furnaces, which, it is believed, insure a more even and uniform heat, and the forgings are required to be immersed in the quenching medium in the direction of their axes. Longer pieces, such as tubes and some hoops, are often distorted a slight amount in treatment and it becomes necessary, before final machining, to straighten them. The specifications allow no straightening after test for acceptance as to physical properties. It is also required that the straightening shall be performed at a temperature between 800 and 900 degrees Fahr. and that after straightening they shall be reheated to the same temperature and

annealed. I have seen physical tests of some shafting, and also some gun forgings, before and after straightening at this temperature, and though these tests showed no difference in physical properties, yet reheating is thought to be a wise precaution, since probably at this temperature the metal is more pliable. I believe tests have been conducted on metal, slightly heated, which have shown a falling off in physical properties at that temperature, which are apparently restored when the metal is again cooled.

When ample allowance of test metal on each end of a gun forging is allowed by the manufacturer, and when, after heat treatment, trial-test bars show the forging to be in proper condition, it is submitted to the inspector for official test. The test specimen used is a standard cylindrical bar 0.505-inch in diameter and 2 inches between measuring points. The number of test specimens taken from a forging varies. From the largest forgings, four specimens are taken from each end, and a smaller number for the smaller sizes. The number of test specimens taken from an end should be a function of the area of cross-section and not of the length. An exception to this would be in the case of a very short ring in which it might not be considered necessary to test each end.

Thus it is seen that if three tests from each end are required from a hoop of a certain length, there would be no occasion for taking more than three tests from each end of another forging, the length of which is two or three times as great; that is, assuming that three tests from an end are sufficient to demonstrate its uniform quality. All bars from gun forgings subject to bursting stresses are taken circumferentially, or rather tangentially.

It is required that the minimum distance of the axes of test specimens from the end of a forging shall be 1.5 inches for long forgings and 1.25 inches for all other forgings. It has been found necessary to prescribe a distance, because tests taken close to the face give a slightly different property where the metal has been quenched, the rate of cooling probably being affected by the radiating surface of the end.



CHARACTERISTIC MICROSTRUCTURES FOUND IN STEEL FOR GUNS—ANNEALED, QUENCHED AND DRAWN

Fig. 30—(At left) Gun steel. Carbon, 0.50 per cent. Tensile strength, 98,000; yield point, 58,000; elongation in 2 inches, 18; reduction in area, 30. Magnification, 80. Fig. 31—(Above) Small forging of 3.5 per cent nickel-steel. Carbon, 0.35 per cent. Tensile strength, 95,250; yield point, 60,000; elongation in 2 inches, 24; reduction in area, 54. Magnification, 82. Fig. 32—(Center) Gun steel. Carbon, 0.45 per cent. Tensile strength, 99,000; yield point, 57,000; elongation in 2 inches, 25; reduction in area, 54. Magnification, 80. Fig. 33—(At right) Gun steel. Carbon, 0.50 per cent. Tensile strength, 105,000; yield point, 63,000; elongation in 2 inches, 26; reduction in area, 53. Magnification, 80

The physical properties prescribed including tensile strength and yielding point in pounds per square inch, elongation on 2 inches and reduction of area in per cent, vary with the type of forging. For alloy-steel forgings they vary from 90,000, 55,000, 18 and 30, for tubes, to 95,000, 65,000, 18 and 30 for certain hoops. For gun steel they vary from 86,000, 46,000, 18 and 30 to 93,000, 53,000, 18 and 30.

It is believed that it would be very desirable to increase the requirements for reduction of area. In my opinion, reduction of area is one of the most desirable requirements inasmuch as it is an indication of the amount of distortion which will result before rupture after the tensile strength has been reached, and it also shows the material capable of sustaining a fiber stress greatly in excess of the tensile strength before actual rupture of the metal occurs.

As will be shown later, the mass of large gun forgings is such that it is practically impossible to eliminate segregations and defects such as ghost lines or streaks from the forging. If the steel were pure, there would not be much difficulty with the modern scientific treatment in meeting the requirements of the specifications as to physical properties. But while nearly all the test specimens from a forging may give results considerably in excess of 40 per cent elongation, there may be one or more bars which will give less, caused by the aforesaid conditions, so that the increase in this requirement would probably be objected to strongly by the manufacturer, unless some provision were made to take care of bars which might fall short.

In figuring the elastic limit and tensile strength in tests, reference is always made to the original cross-sectional area which in the test bar used is 0.2 square inches. Thus the stress per square inch is obtained by multiplying the actual load on the beam of the testing machine by 5. Even at the point when the tensile strength has been reached, there has been a slight reduction of area so that the actual sustained load on the test bar at that point has been greater than the recorded tensile strength. In the same manner if the actual sustained load on the beam could be measured after the test bar has necked down and just before rupture, it would be found to be very much greater, due to this reduced area. This sustained load at rupture, or rupture stress as

it has been called, seems to me to be of extreme value, and it would be of value to develop some practical method of determining and recording it.

The elastic limit is required to be determined by the use of the micrometer extensometer. This requirement may be waived, provided the testing machine used is shown to have no difference between the elastic as determined by the drop of the beam and the micrometer readings for the grade of material in question. Of course this would only be true in machines where friction and inertia of moving parts are inconsequential.

Loads below the elastic are required to be applied in accordance with a table in the specifications, and for each load the actual extension must be recorded. It is required that the accuracy of the testing machine shall be verified at least once each year.

Three official submissions for physical tests are allowed on each forging, which may be either without or following retreatment. In case one bar from an end on physical test fails in extension and breaks within 0.5-inch of the measuring point, or in case one bar from an end breaks and the fracture shows that it failed because of inclusions of sand or slag, an extra bar is allowed immediately in wake of, and nearer the finished metal than the failing bar.

The tensile specimens are the only ones taken for physical tests from material for gun forgings, and are all that have been considered necessary, in view of the fact that the final test consists in the proof firing of the gun. In the test of material used in foreign gun construction, it is understood that the physical properties are generally lower than those prescribed for ours, but certain other tests are required in addition, such as mandrel tests, bending tests and fatigue tests. These last tests, when autographic vibratory machines reach perfection, may prove of great value and may demonstrate the unsuitability of material which would not be shown by other tests.

During the past year or so, for the purpose of collecting information, we have been examining and photographing the structures of many gun forgings. The test specimens are usually sawed off in the threads and the button thus formed is polished and etched in the usual manner. A number of characteristic structures found in what are considered to be excellent forgings are shown in Figs. 26 to 33.

The use of nickel appears to insure a finer grain as well as to prevent the precipitation of the same amount of ferrite, that would result in plain gun steel.

Microscopic and macroscopic inspection has proved of the greatest value in investigating the character of defects in large forgings which are often noted in machining. These defects have been referred to in the specifications as follows:

In the case of streaked forgings, that is, forgings showing striations of different-colored metal, careful examination will be made to see if there is any lack of continuity of the metal along such streaks. Such lack of continuity determined by the breaking or parting of the chip in turning or in chiseling in the direction of the streak, or in any other manner, will cause the rejection of the forging.

Slag pockets and sand splits or cavities containing particles of slag, sand, or other foreign material will be treated as local physical defects in the steel, the seriousness of which will depend upon their location in the forging, their number per unit area of surface, their size and form, etc. If isolated and small their presence in a forging otherwise sound and satisfactory will not be deemed important; if in clusters or extending over a considerable surface, indicating a porous condition of the metal, the forging will be rejected.

Defects commonly known as streaks and sand splits exist to a certain extent in all large forgings, where the ingot from which they have been made has been one of considerable mass, but every effort is made toward reducing them to a minimum. The defects known as sand splits are detected only in the inspection of surfaces smooth machined, and are found generally in the bore of large forgings after the last machining operation. They vary in size from the most minute specks to small pockets as long as ½-inch. At times larger ones have been observed. These splits, which are generally elongated in the direction the metal has been most worked in forging, contain inclusions which often in the larger ones may be picked out with a small penknife, and resemble sand. Some of them contain a harder inclusion more difficult to remove. They are certainly related to the microscopic inclusions of sulphides and silicates which are generally segregated in ghost lines or streaks.

In Fig. 18 is shown, at a magnification of 80, a microscopic inclusion of such a size that it appeared on the polished surface of the specimen to the eye without magnification, as a pin point. This inclusion appears to contain three substances. One, which is slate-colored (the darker in the photograph), is believed to be silicate of manganese. The matrix, which is dove-colored, appears to be manganese sulphide. The third constituent (white in the photograph), is not understood. This specimen was from a piece of extremely impure steel; and the dark boundary of the inclusion which appears in the photograph is a cavity caused by ripping out a portion of the inclusion in polishing. There are also shown numerous spots of sulphide.

Streaks appear to be of two general classes. They are noted as faint lines in the bore and on the surface of machined forgings, where the metal appears slightly brighter or darker in color. Polishing the surface and etching with iodine solution in alcohol will bring them out clearly, as will also sulphur prints.

Sulphur prints, which are often made to investigate forgings where segregations of sulphides are suspected, are made by polishing carefully the surface to be examined, cleaning it off very carefully with alcohol to remove all oil, then placing upon it, face down, a piece of bromide paper which has been immersed in a solution of hydrochloric acid. After a few seconds the acid will attack any segregations of sulphides, discoloring the paper and the photograph so formed is then fixed in the usual hypo solution. These sulphur prints bring out clearly the streaks when the inclusions which predominate in the streak are sulphides. Many streaks and inclusions are noted, however, in forgings when no clear sulphur prints of them can be obtained. These inclusions, which are generally slate-colored, are hence believed to be silicates. It should be noted that a sulphur print can be obtained from the polished surface of any piece of steel inasmuch as the sulphur in the steel, if almost entirely in the form of manganese sulphide evenly distributed, will cause an impression on the sulphur print of many specks which may appear to be more serious than the condition warrants. When these streaks are examined after etching with the usual solutions, under the microscope, their character is clearly brought out.

In the first class of streaks which I have noted, there is a marked predominance of ferrite and an extremely fine grain. On each side of the streak the grains increase in size until the normal sorbitic structure is noted. Scattered along the streak are generally found many microscopic inclusions of sulphides and silicates, often in lines. The metal in these streaks does not appear to differ from that on either side of it as to machining, and scleroscope readings do not show any difference in the hardness. When

the inclusions are arranged in lines they, and many lines or cracks adjoining them, are carefully examined. In the worst of these streaks, where the inclusions are in such number and of such size as to cause an actual break in the continuity of the metal, their seriousness would be indicated by chipping out the metal and the minute breaks would be shown by an examination with a small magnifying glass. The general character of one of these streaks is clearly shown in Fig. 20, in which a line of very small inclusions is also shown. This was a small streak which extended through a physical test specimen which had passed test; and the only noticeable effect was a falling off in reduction of area as compared to other bars from the same forging which did not show the streaked metal.

In the second class of streaks which I have noted, the grains are much larger and there is not so much ferrite predominating as on either side of the streak. On some of these streaks, a difference in the scleroscope readings is noted and the metal is shown to be harder. The inclusions noted are of the same nature in both classes of streaks. These streaks are more broken and irregular. Their characteristic structure is shown in Fig. 21. The small test specimen which this structure represents, exceeded all the physical requirements.

The question of streaks and sand splits is being constantly studied and all such defects, even though very slight, are made a matter of record. The final test of the gun, of which these forgings are made, of course, is the proof-firing. The photographs of streaked metal are of streaks of the less serious nature. In the more serious streaks, which are rare, the metal will break off in machining and actual breaks in the continuity of the metal will be noted on macroscopic inspection.

In Figs. 26 to 33 are shown characteristic average structures found in gun forgings. These structures in general consist of sorbite and ferrite intimately mixed and are logical structures following the treatments which they have received. Some structures appear to be pure sorbite, and almost amorphous, but these are generally the smaller alloy-steel forgings such as breech blocks and short hoops for the smaller guns. Gun forgings to meet the properties required after the preliminary annealing specified, are quenched and drawn.

In Figs. 19, 22, 23, 24 and 25, is exhibited a peculiar structure which is often noted in gun forgings. The structure, consisting of a network of ferrite and sorbite, shows much of the ferrite in definite parallel lines within the cells, in some cases having an almost triangular formation. At a high magnification, this structure resembles greatly the structure of an ingot at a low magnification. It is thought to be due to the structure formed in quenching, running from troostite to martensite according to the composition, which has persisted after drawing, allowing the ferrite on rejection to mass along the lines of this structure. The physical test specimen from which Fig. 23 was taken gave excellent results.

Before closing this paper, I will refer briefly to one other class of forgings which has caused concern in drawing up requirements, namely, the air flask of the torpedo. This forging is about 8½ feet long and 21 inches in diameter, and contains the air chamber for propelling the torpedo. It has to sustain a very high internal pressure and of necessity must be as light as possible. For the test of the forging, two tensile tests are taken from each end. We have obtained a number of forgings which have passed specifications requiring 120,000 pounds elastic limit with 12 per cent elongation in 2 inches and 35 per cent reduction of area. Various specifications on other contracts have varied from this to 105,000 pounds elastic limit with 15 per cent elongation and 40 per cent reduction. To meet such specifications, an extremely pure steel is necessary. It has been noticeable in such tests as I have witnessed, that a small and inappreciable amount of slag may cause a test bar to break off short in this material, whereas the same amount of impurities in material in a softer condition would have an inappreciable effect on the results obtained by testing. This point is thought to be an important one, which should be considered by designers.

Possess Inspection Facilities

In conclusion, I might say as regards metallographic inspection, that at present in the larger inspection offices we have a Tassin microscopic outfit which can be applied to forgings in the shop if desired, or set up in our laboratory for examining smaller specimens there. This microscope has a photographic attachment and we have a dark room so that we may develop our own photographs as taken. It is our general practice in examining specimens for polishing, to examine before etching, then to etch lightly and examine, and then to etch deeper and examine. In examining under the microscope we generally get as big a field, or low magnification, as possible at first and then examine with our standard magnification of about 100; and if interesting points are noted we then examine with higher magnifications. We have a portable polishing apparatus which we can carry into the shops and polish surfaces desired. We also have a scleroscope which we use generally for experimental purposes.

It will be seen that our aim at present in using the microscope in inspection is to collect all the data possible and to gain additional information regarding defects which may be noted in the usual inspection. It appears that the microscope is continually finding new uses to the manufacturer and more manufacturers are taking it up each day. It is believed that it has a big future, both to the manufacturer and later, probably, in inspection.

To Change Mining Laws

Secretary Lane in his forthcoming annual report speaks of the necessity for a new set of mining laws. "The old code," he says, "is so elaborate and complicated that the best of brains can not tell what the law is. The truth seems to be that between mining engineers and mining lawyers the rules of the game have been refined into obscurity; and if congress were to say to the President that he might select three men familiar with mining laws and miners' difficulties to suggest a new mining code to congress, it would, I believe, be giving in earnest a new freedom to the mining industry."

An interesting diagram comparing the methods by which mechanical and hydrostatic lubricators supply oil to engine cylinders is a feature of a 12-page bulletin issued by the Richardson-Phenix Co., Milwaukee, which describes the company's ratchet-type lubricator, as well as a newer model. Numerous illustrations show the application of the company's lubricators to engines, pumps, steam hammers and other machinery. In a 20-page booklet, also published by the Richardson-Phenix Co., its sight-feed oil pump is described, the illustrations depicting the process of manufacture from raw material to finished product.

A chapter on gas engine lubrication discusses methods of timing the admission of oil to secure maximum lubrication. The company's air spray attachment and its steam and electric devices for heating the oil in the lubricator reservoir are also described.

Dumping Problem Is Complicated

THE PROBLEM of framing effective anti-dumping legislation is exceedingly complicated. Considerable difficulty arises from the fact that foreign nations may retaliate, cutting off our exports. In this article the question is reviewed in all phases. The establishment of a scientific bargaining tariff is advised

BY HENRY C. EMERY

SO MUCH confusion exists regarding the nature of dumping and the problem of anti-dumping legislation that a few general propositions must be stated at the outset in order to clear away certain popular misconceptions and to make the real proposition clear. The general feeling seems to be that the practice of dumping is something new; that it is abnormal and necessarily sporadic, as well as immoral and improper, and that it will threaten us with an entirely new and grave danger at the close of the European war.

I submit in reply that the practice of dumping is as old as the world market; that the practice may be entirely normal and continuous rather than sporadic; that in its ordinary meaning and most general forms it is not immoral nor improper, and that the real danger which threatens us after the war is not that European manufacturers will sell goods in our markets below their own cost of production, but that they will sell goods below our cost at home. Just a special word on this last point: Sometimes those who speak of European manufacturers "dumping their goods" in our market after the war mean only to indicate the certainty of a great flood of cheap products which may seriously jeopardize our established industries. With that opinion I agree heartily. In fact that danger seems to me so very serious in itself that I think we relatively exaggerate the very special danger that our foreign competitors will "dump" in the technical sense; that is, will sell their goods in this country cheaper than in other countries or their own country.

No "concerted drive" against the United States is necessary. Individual guerilla warfare is enough. Also the foreigner does not necessarily need to sell goods here *lower* than at home. If he sells them at his home price our manufacturers may still be "up against it." What I say then is not directed to show that a danger does not exist—it is only to show that anti-dumping legislation will fail to meet the *real danger*. Come back for a moment to the question of whether or not dumping is a normal and long-established custom. Frequently a thing exists for a long time before the magazine writer or even the professional economist finds it out. Some years ago somebody not accustomed to business found himself startled by the discovery that American manufacturers were sometimes selling goods abroad at a price lower than that charged to the domestic consumer. So far as I remember, the first excitement was stirred up regarding agricultural machinery. Consequently some conclusions were quickly drawn, which, although entirely erroneous, have endured to an extraordinary degree to the present day. They are to be found both in the reports of commercial organizations and the writings of economists of high reputation. Besides the inferences that such practices were new, temporary and presumably immoral, two other conclusions were drawn at this time: that dumping a surplus product in a foreign country can only take place when the dumping manufacturer is protected in his own country by a high tariff wall; and that such a practice can only be carried on by a large trust with a considerable monopoly control of the output.

As a matter of fact neither of these theories holds. Certainly it is not true that a tariff is necessary for this purpose. Long before the problem became one of particular interest to this country it was a regular practice on the part of certain manufacturers in free-trade England. Furthermore it can be carried on as easily by an American manufacturer who is engaged in an unprotected industry as by one who is engaged in a protected industry.

I well recall the first actual case of the kind in which I became personally interested, and this was more than 20 years ago. It was the case of a small flour miller in Topeka, Kansas. Here there was no element of monopoly or protection, for even if the duty were taken off flour I do not believe the citizens of Topeka would be baking the flour of Budapest.

It was for many years the regular practice of this manufacturer to sell the larger part of his product in the Kansas City market and to ship the balance to Glasgow. The Glasgow consumer was able to buy the flour for less than the consumer at home. This was not an unusual case but was, even at that time, a very common practice among all business men. I refer to it as typical and as showing how many false assumptions we have allowed to arise.

Besides the false assumptions of fact as to tariff and monopoly there are deeper ones of theory,—primarily two: That a uniform product sells at a uniform price at any given time; and that the price of each individual product fluctuates in a continuous relation to its cost of production. The facts are, of course, that a business man sells different portions of the same product at different prices; and where he has a variety of products he sells some close to the cost of production and some at a good margin of profit.

We need to recognize that the same principle which is now accepted as entirely proper as a basis for railway rates is really applicable to practically all lines of business and, I may add, of personal service as well. It applies to the manufacturer, the wholesaler, the retailer, even to the clergyman and the economist. I refer to the principle called "charging what the traffic will bear," with its assumption that it is neither desirable nor possible to always charge the same price for the same service. Of course, discrimination between

Legitimate Dumping

We are in a peculiar position. In general our domestic prices are relatively so high that dumping in our market is not so necessary as in other markets. The foreign manufacturer can commonly meet the situation by offering his goods at his regular home prices. On the other hand, prices in foreign markets are so low that the American exporter is largely driven by the sheer force of international competition to sell his surplus at some reduction. For this reason I believe any movement toward a general extension of anti-dumping legislation may prove dangerous to American exporters.

A paper presented at the recent National Foreign Trade Convention at New Orleans. The author, H. C. Emery, is former chairman of the United States Tariff Board.

shippers has been given up as bad business and bad morals but it is still necessary to make discrimination between different classes of goods without reference to the cost of the service performed; and even in the case of the same commodity it is necessary to discriminate between markets. It is not possible to establish a uniform rate per mile for hauling the same commodity in all directions and in all parts of the country. The reason for this is well known to business men.

If the highest rate is charged on all commodities much business could not be carried on and the railroads would become bankrupt. If the lowest rate is charged on all commodities the railroads cannot pay expenses. By making elaborate classifications based upon long experience both the railroads and the public are best served. This principle explains the necessity in all lines of what may fairly be called dumping.

To get the best results in the way of the largest product at the lowest cost, the flour miller, for example, must keep his plant going continuously at full capacity. Under these conditions the cost of flour per barrel, in general, is made the lowest possible. He cannot market his complete output in any single market at a single remunerative price.

Note, however, that it is not necessarily a matter of different countries at all. A miller who sells ordinarily in Kansas City can dump in Glasgow or he can dump in New England. It all comes down to the simple fact that the old assumption as to complete competition never was true. Manufacturers have certain markets in which they are able to dispose of standard goods at standard prices and where they cannot afford to reduce such prices even to face occasional dumping from outside.

It is impossible to discuss here just how they are able, in the long run, to hold these markets, whether by personal reputation, long-established custom, recognition of quality of wares, or other reasons. The fact remains that they hold on to such a market and then dispose of their surplus, at such price as they can get, in what to them is a neutral market, whether within the confines of their own country or not.

Principles of Dumping General in Economic Activities

We appreciate today that the grocer must sell some articles at a large profit and some at no profit at all. He must figure out how on all of his commodities according to the principle of charging what the "traffic will bear", he can make a profit on his total sales. If the producer raises to him the price on sardines he does not (as the old theory supposed he did) raise the price of sardines to the consumer. He may raise, instead, the price of sugar or canned corn to some other consumer.

The woolen manufacturer has to sell a portion of his product at prices which in relation to their cost would be ruinously low if he did not make up for these prices by making unusually good profit on certain other articles. Again it is all a question of what the market will stand.

The same is true of services. A finishing mill doing business on commission must regulate its charges primarily according to what different fabrics will stand in the way of additional charge on their path to the market.

Even if the cost of finishing more expensive weaves is not greater than the cost of finishing less expensive weaves the finisher must usually charge more. If he charges his low rate for everything he cannot stand it; if he charges the high rate on everything his customers cannot stand it.

Principle is Universal

As I have said, the same may be true of services rendered by a professor or a clergyman. Only rarely is it possible for a man to fix a standard rate for a lecture or a sermon, and never vary from it. He must lecture sometimes at one price, sometimes at another, regardless of the quality of the lecture. If he sets a very high price he will receive it in a few instances but will not give enough lectures to utilize the full capacity of his plant. If he fixes a very low price he can give as many lectures as he is able but without a sufficient return to keep him alive. Thus it seems to me this principle goes through all life. I once asked a small Italian vender in a country town, "Joe, are you making money on your peanuts?" To which he replied: "Make-a on ze peanut, loosa on ze damn ba-nan!" I think Joe here expressed both a wide experience on the part of business men and a profound principle of economic necessity.

A new element has been injected into the discussion by the inclusion under dumping of what is called "unfair competition". This has become important as a problem of international policy through the recent recommendations of Secretary Redfield, and through the "Australian Industries Preservation Act". The two practices are closely connected, but it beclouds the issue not to keep them distinct. So far we have considered dumping to mean the common practice of selling a portion of one's goods at prices which would not be remunerative for the whole product. What is our problem here? We have recognized that in the first place it is entirely proper for *A* to adopt this policy; in the second place, that it is entirely proper for *B* if his own business is thereby affected, to oppose it by legitimate means. These facts apply to countries as well as to individuals.

What policy shall this country assume? Much has been said about the legislation adopted in Canada and other British colonies. I assume knowledge of this legislation on the part of this audience. It would be impossible to describe it in detail within the limits of this address. On the whole, the Canadian practice is the soundest of the experiments yet attempted. It provides for the imposition through order in council of a countervailing duty on goods sold to Canada at prices less than those in the country of manufacture. No one can fail to be interested in such an ingenious experiment as this. It has been widely advocated as a model for legislation in this country. The present tariff act as it left the house contained such a provision which was wisely struck out in the senate. We must remember that our situation is very different from that of Canada and not jump hastily to the conclusion that we can adopt such a practice outright.

What about our own position in regard to selling surplus products abroad? Do we wish to help start a movement, as yet confined to a few sparsely settled colonies, which will become the practice of our leading competitors? What would be the position of our own export trade if all countries should adopt the principle that goods cannot be sold in foreign markets for less than the established prices of the domestic market? That is a question you gentlemen understand without further words from me.

Is Such Legislation Practicable?

There arises also the question whether such legislation is practicable for a country like ours. It is noteworthy that as yet the practice has been confined to a few British colonies, and has not been generally adopted by large nations with manifold lines of industry. In fact, those conversant with the origin of the Canadian law know that it was adopted not so much as a general proposition as a specific measure to meet the competition of particular manufactures in this country.

The legislation of New Zealand is aimed at one particular line of manufacture. A policy adopted for very definite ends by a small country with

a limited number of industries cannot always be adopted for very general purposes by a country which has a great variety of industries. A few points of difference may be noted:

The Canadian machinery of government for this purpose is lacking here. We have always been jealous of executive interference in tariff legislation. In Canada they have the simple device of orders in council with which we have nothing to correspond. The Canadian law has in practice been applied usually to relatively simple cases. It is one thing for the Canadian government to determine that plows of American manufacture have been sold in that country below the cost charged in the United States, and to determine what the exact difference between the two prices is. Under such circumstances it is easy to add this difference in price to the regular amount of duty.

With our population of 100,000,000, with their innumerable demands for foreign goods and their innumerable activities in home production, what would happen to a government which attempted to handle with any degree of efficiency the problem of examining every complaint on the part of a domestic manufacturer to the effect that somebody, somewhere in the world was trying to sell goods in this country at a rate lower than that in his own country?

I wish to go on record for saying that some application of the anti-dumping principle may probably in the future be made a proper part of a fully elaborated and carefully devised tariff system. I submit, however, that the mere adoption of the Canadian law or any hasty application of this idea will lead to difficulties which will not only completely swamp the administration of customs but may easily work unexpected evils both to our domestic industry and our export trade.

"Unfair Competition"

I have referred above to the proposal of Secretary Redfield and to the Australian Act. They both aim at "unfair competition". The Australian Act goes farther than the secretary in classifying as "unfair" (and hence to be prohibited) imports which would lead to Australian goods being sold at a loss; which would throw workers out of employment, or force them to accept "inadequate remuneration"; or which "would probably create substantial disorganization in Australian industry". In the face of such provisions Nelson Dingley would appear almost a free-trader!

The secretary goes farther than the Australian Act in that he would make the imports forfeit and visit penalties on the domestic importer; this on the ground that the practice aimed at is "an attempted wrong to be forbidden rather than an economic matter which needs to be restrained". In making such an assumption he has in mind a kind of dumping entirely different from that outlined above or from that ordinarily understood by the term. He has in mind something similar to the so-called unfair practice of a big trust which reduces locally and temporarily its price for the distinct purpose of driving John Jones or James Smith out of business. I agree that such a practice is one which should be prohibited by law if it can be proven to be done for the object of establishing a monopoly.

I submit, however, that the secretary is wrong in thinking that the chief danger of foreign competition will be found to lie in the action of some foreign monopoly in attempting to ruin some specific American manufacturer. The danger will come in the ordinary course of fierce competition. Let us not confuse the two issues in this regard. Further, there are insuperable practical difficulties to the proposed scheme.

The Secretary's test of unfairness is that of "prices materially below the current rates for such articles in the country of production or from which shipments are made, in case such prices substantially lessen competition on the part of American producers or tend to create a monopoly in American markets".

The claim that their power to compete has been "substantially lessened" would be set up by a host of manufacturers. It is a phrase fraught with much protectionism, and with grave danger to innocent importers. Shall all German dyes be confiscated on arrival? Must the importer on every simple contract investigate the motive of his seller, or ascertain just how "substantially" he is interfering with the competition of home producers? Every importer would have to have a tariff commission of his own. And now how about prices at different periods? I contract to-day at prevailing prices for delivery three months hence. The price in the producing country rises in the meantime. Am I liable? If not, is my competitor to be stopped by law from getting the same terms three months hence if he can? One profound objection any lawyer would see at once. The analogy with the domestic law does not hold. In that case it is necessary to show a continuous practice tending toward monopoly. No conviction could be secured on the basis of a single contract. But in proceeding against the purchaser, it is necessary to hold him liable for a single purchase. The cases are totally different. The offending trust goes free and the customer is penalized for a single, and very likely, quite ignorant offence.

Difficulties of Application

There are plenty of other difficulties. It is impossible to utilize the agents of the treasury and the department of commerce for such a purpose. It is already difficult enough to utilize these agencies for the purpose of establishing foreign values on which duties shall be levied, but mark the great difference. At present the evidence or the investigations of such agents may serve as a basis for valuation. If the valuation on such evidence is raised by ten per cent, the duty is raised proportionately. It is a far different proposition to say that if the statements of our own agents differ by five per cent or ten per cent from the invoices on which goods are sold, that these goods shall be confiscated in toto or that our own citizens who import them shall be subject to fines and penalties as guilty of misdemeanor.

The fact is, as already suggested, that without reducing his price below that of his own domestic market, the French exporter may be able to put goods into this country at such a price as to make the competition of the domestic producer with him very difficult. To meet the price of the French producer the German may have to reduce his price for the American trade below the German price. You may say that by so doing he is doing something immoral. If so, why should he not be attended to by the German government? So far as his

What is the Real Problem?

Furthermore, I believe it entirely impossible to distinguish between dumping in the supposedly immoral sense and the other kind of dumping which we recognize as proper among ourselves. Is the real problem to stop practices based on immoral motives of foreigners, or to protect ourselves against practices injurious to us whether moral or immoral? After all, the object of all these suggestions is not to punish anybody whether the importer at home or the producer abroad so much as to make impossible such an attack on American industry as will tend to cripple it.

effect on American industry is concerned, it is exactly the same as that of the French exporter whom we agree has done a proper thing.

Is it not our business to have regard to the effect of any action upon our own business rather than to consider the different methods of the two rival foreign exporters in their domestic relations? If the proposed scheme were carried out importer *A* might buy goods of a French exporter at 75 cents a yard, importer *B* might buy the same goods from a German exporter at 75 cents a yard, and both might be trying to monopolize the American market. The conduct of importer *A* would be above reproach. Importer *B*. however, because the man from whom he bought had a somewhat higher cost of production, would be liable to have his goods confiscated and be subject to fines and penalties. I submit that in the light of difficulties of this kind the scheme is practically unworkable even if it has the appearance of ethical soundness.

The Real Need

I have said that a grave danger exists, first to our home industry, second to our export trade. And I have said that I believe that recent schemes as to dumping legislation do not meet the issue. What does? I think the answer is to be found in Mr. Straight's proposition of a "flexible tariff". In the first place, on Mr. Underwood's own principle of a "competitive tariff", it is necessary when new conditions of competition arise to make readjustments of the tariff so that the American manufacturer can compete. If we are threatened by new conditions we should provide a general scheme of tariff duties adequate to meet those conditions.

Be sure of one thing, foreign manufacturers in search of our market will be much better pleased in most cases by a 25 per cent tariff plus an anti-dumping clause than by a 35 per cent tariff without such a clause.

But this is only half the story. As Mr. Straight has said, there will be a great readjustment of tariff relations and tariff treaties. Whatever general tariff is adopted it is vital to American export interests to see that it is so framed that we can take advantage of those readjustments.

We must arrange for a bargaining tariff. We must frame our duties so as to be able to make trades by means of mutual concession. This is no part of my subject but may I refer to a previous paper of mine before this body in which I examined the various methods of tariff bargaining? In it I attempted to show that reciprosity treaties, in the strict sense, will not work, and that our experiments both in the Payne-Aldrich act and in the present act offer little of value. On the other hand, a proper study of how to adjust a maximum-minimum tariff to both the traditions of American government and the conditions of American trade will yield great results.

Whether these conclusions were sound does not matter here. The question in any case needs your grave consideration. Now is the time to prepare. If we delay further in our preparation the other countries of the world will have made their arrangements before we even know what to ask for—still less how to get it. So far as the tariff question is concerned, I should say that this should now be the supreme object of your honorable body.

Bearing Metals

The American Railway Engineering Association has recently issued a bulletin written by G. H. Tinker, bridge engineer, New York, Chicago & St. Louis railroad, on "Bearing Metals."

"Such metals," declares Mr. Tinker, "should have a low co-efficient of friction, high resistance to wear and sufficient strength to resist distortion by crushing. In the case of gears and screws, a certain tensile strength and resilience are also required. The final criterion of the suitability of a metal for a specific purpose is its behavior under actual use. To determine the probable behavior of a metal submitted for such a purpose, the nearer the test applied duplicates the actual conditions of service the greater our confidence in the probable outcome. It is also necessary that the test should be easily, quickly and cheaply applied. Last, but most important, it should give concordant results.

"Friction tests are difficult to make. So also are wear tests. Resilience tests are unsatisfactory. There remain compression and tension tests, which fulfill all the requirements of a test except that it appears doubtful if they furnish sufficient evidence of the probable behavior of bearing metals in service. Our knowledge of the nature of the phenomenon of friction is theoretical. The latest theories lead to the corollary that the harder a substance is the greater are its anti-friction qualities. There is some evidence of a definite relation between hardness and tensile strength. The existence of a definite relation between hardness and compressive strength is, however, not established. As to the relation between hardness and resilience, there is a point in the hardness scale where hardness is accomplished by brittleness and resilience decreases. It thus appears that hardness may or may not indicate the presence of the qualities desired in a bearing metal.

"We have some evidence that the ability to resist wear is indicated by density rather than hardness. The suggestion of adding a small amount of lead to phosphor bronze has been made, with the idea of increasing the density. It is undoubtedly true that the addition of lead tends to raise the friction co-efficient, but it does not follow that the metal having the most desirable qualities will have the lowest co-efficient of friction. It is not shown that the several qualities desired follow the same law; they may be antagonistic, in which case the most suitable compromise must be chosen.

"It is recognized that neither compression nor hardness tests on bronzes always give concordant results, owing to the effect of various conditions of manufacture, that being a good reason for controlling the chemical composition within narrow limits.

"Although the making of hardness tests has become more frequent in the last few years, the data are not yet sufficient to enable a definite set of figures to be adopted for bearing metals. Evidence to show that a bronze of a given hardness is the most suitable for a specified use, is not yet extant. It should be kept in mind that the hardness test is an indirect test. A metal is suitable for a bearing not because it is hard, but because, being hard, it is likely to have a low frictional resistance, or is likely to wear well, or is likely to be able to sustain a certain pressure without distortion. In the case of steels, the hardness values corresponding to certain specific qualities are better known. The compression test is a direct test of one of the qualities desired, and should not be discarded until we are better and more definitely informed as to the proper hardness numbers. To this end, the collection of data should be at once undertaken by all users of bearing metals."

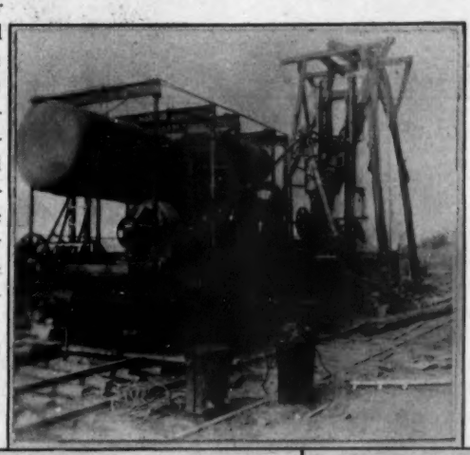
W. W. Fowler & Co. has been organized, W. W. Fowler, president, and C. F. Dunn, secretary-treasurer, with offices at 1510 Lytton building, Chicago. The company represents the Northwest Trading Co., Seattle, which does an export business with the Orient. The Chicago concern is inquiring for finished steel products, nails, wire, sheets, etc., for shipment to China and Japan.

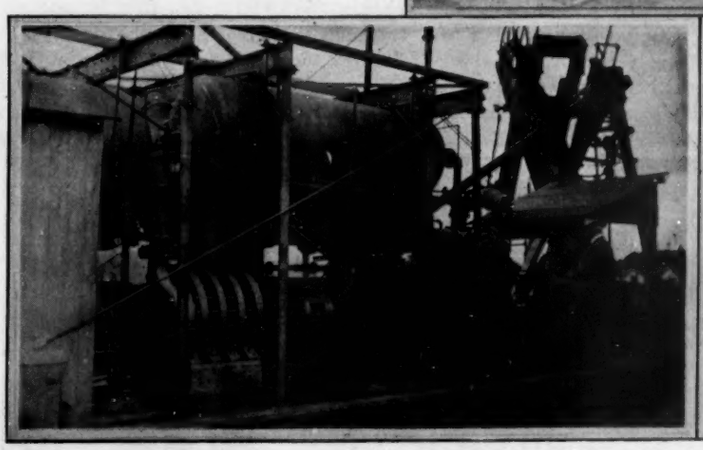
A New Electro-Hydraulic Shovel

STEAM SHOVELS have been used in the Lake Superior iron ore country for a great many years. This form of digging apparatus, however, has certain disadvantages, which have led inventors to turn to electricity as a power source. This article describes an ingenious electro-hydraulic shovel of recent design

BY FRANK H. ARMSTRONG

ALL THE mining machinery of Penn Iron Mining Co. has been operated by electric power for several years and when another shovel for stockpile loading was required the advantages of an electric shovel were naturally considered. After considerable study, serious objections suggested themselves to a shovel operated directly by electrical apparatus by reason of the complicated control, severe service on the motors and the heavy surges of current required from the line. It was finally decided to construct an electro-hydraulic shovel using water under pressure to perform all the necessary operations except that of propelling, for which a separate motor was thought best suited. A car body with boom, dipper handle and dipper of late design, but without any of the steam machinery, was purchased. A motor-driven centrifugal pump, a pressure tank, an air tank, a small air compressor and water cylinders with plungers, pistons and valves, were installed in place of steam equipments. Fig. 1 shows this shovel under construction and Fig. 2 shows it as it was operated during the first year, the summer of 1914. The large tank at the back of the car, in Fig. 1, carried air under a pressure of 275 pounds. The smaller tank, seen best in Fig. 2, is the water-pressure tank into which the pump discharged and from the bottom of which the water was taken by the main header to the valves. Back of the water-pressure tank is another tank, the end of which can be barely seen in Fig. 2, used as a suction tank, which received the water exhausted from all the cylinders and from which the pump drew its supply.





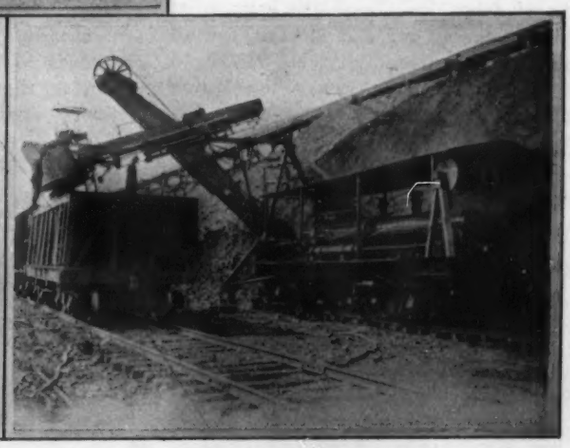


FIG. 1—ELECTRO-HYDRAULIC SHOVEL UNDER CONSTRUCTION

FIG. 2—THE SHOVEL AS IT WAS OPERATED DURING THE FIRST YEAR

FIG. 3—ELECTRO-HYDRAULIC SHOVEL WITH COMPRESSED AIR TANKS REMOVED

The shipments of ore during the summer of 1914 were so small that the new shovel was not given a thorough test, but during the summer of 1915, the shovel requirements were more favorable. It was soon found that the tanks and the air compressor could be dispensed with, since a sufficient capacity could be obtained without the use of compressed air, by reason of the fact that the capacity of a centrifugal pump increases rapidly as the head decreases. The removal of the tanks improved the appearance of the shovel as well as lowered the center of gravity. Fig. 3 shows the shovel after the changes had been made.

The dipper is hoisted by means of a large cylinder and plunger. The double hoisting ropes pass around two sheaves at the outer end of the plunger. One end of these ropes is anchored to the front flange of the hoisting cylinder, while the other end is fastened to the dipper. The dipper travels 2 feet for every foot the plunger travels. The cylinder is single acting, since the weight of the dipper pulls the plunger back when the valve is open to exhaust.

The swinging of the boom is effected by means of a double-acting cylinder with a piston and rod extending through each cylinder head, with a sheave at each end of the rod. The swing circle at the base of the boom is moved by a rope, the middle of which passes around the front end of the swing circle and the ends go around the sheaves on the ends of the rod and fasten to the car body.

As shown in Figs. 3 and 6, the thrusting is done by the piston rods of four thrusting cylinders directly connected to the dipper handle. The four cylinders

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A paper presented at the recent February meeting of the American Institute of Mining Engineers. The author, F. H. Armstrong, is mechanical engineer, Penn Iron Mining Co., Vulcan, Mich.

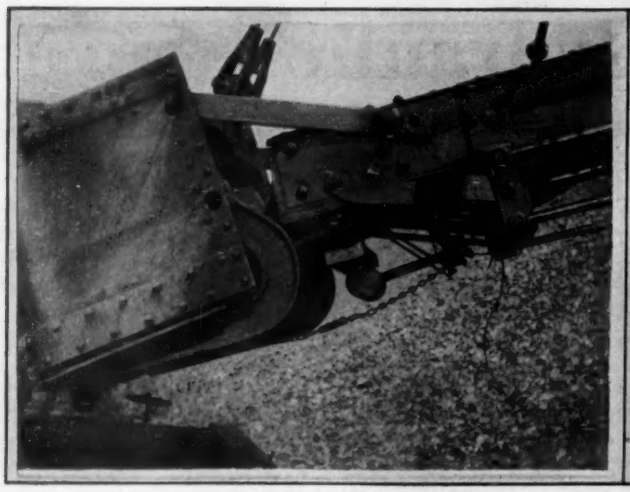


FIG. 4—DIPPER OVER CAR

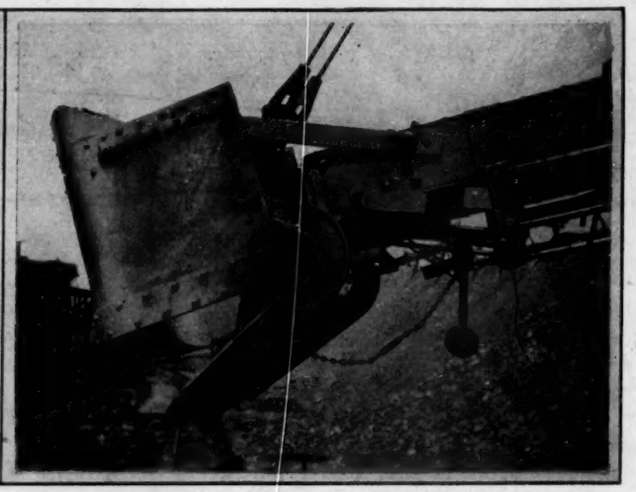


FIG. 5—WEIGHT RELEASED, DIPPER DOOR OPEN

give a perfect balance around the shipper shaft. The piping to the thrusting cylinder is made with swivels and sleeve joints, so that the dipper can be raised or lowered, or the boom swung either way or raised without putting any strain on the piping.

The shovel is operated entirely by one man as shown in Fig. 8. His right hand does all that the craneman on a steam shovel does. He pushes the lever from him to thrust out and pulls it toward him to bring the dipper in. His hand if dropped a trifle strikes the button shown below the hand and trips the dipper door. His left hand operates the valve for the hoist; forward to hoist, toward him to lower. His feet operate the swing valve by pushing on levers that are interconnected. By pushing on his left foot he swings the boom and dipper to the left, by pushing on his right foot it swings them to the right. When the feet are even, the valve is in the stop position to which the valve is brought automatically by a centering device. The handle of the controller for the motor which propells the shovel is seen under his right elbow.

Considerable manual effort is avoided by a solenoid tripping device for the door of the dipper. This is shown in Figs. 4, 5, 6 and 7. A weight on a long arm suspends from a horizontal shaft and tends to hang vertically, being parallel to the dipper handle when the dipper is down. A small catch holds the shaft from turning as the dipper is hoisted, and when the dipper handle is horizontal the weight is ready to fall as soon as the catch is tripped. On the same horizontal shaft is a short arm the end of which is connected by a chain to the latch of the dipper door. When the weight falls, the jerk with the leverage which the weight exerts upon the short arm, pulls the chain, and trips the dipper door. The small catch is released by a solenoid operated by the button under the operator's right hand. Fig. 6 shows the dipper down with the weight caught; Fig. 4 shows the dipper over the car with the weight ready to fall; Fig. 7 shows the weight tripped and the door open.

The average speed of the machine is between three and four dippers a minute. Repeatedly, 3,000 tons have been loaded in a 10-hour day, although the railroad service required shifting every two or three cars. Much more could have been loaded if good car service could have been obtained. With some slight changes it will be possible to increase even this speed of operation to a considerable degree. The power required and the

FIG. 6—DIPPER DOWN, WEIGHT CAUGHT

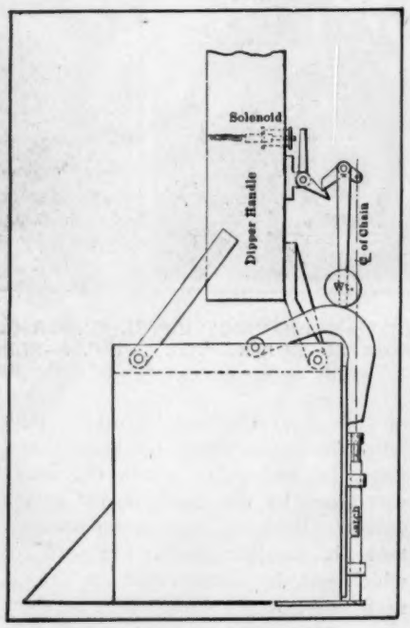


FIG. 7—DIPPER DOOR TRIP

FIG. 8—ALL SHOVEL OPERATIONS ARE CONTROLLED BY ONE MAN

speed of the shovel are shown in the chart, Fig. 9, from a recording wattmeter.

This shovel has few moving parts as compared to either a steam shovel or a straight electric shovel. There are no gears, clutches, brakes or drums. The few moving parts, except the motor and pump, move very slowly. The pump gives no trouble since the water is clean and mixed with a lubricant. The leakage is small so that a hydraulic oil that will not freeze can be used in winter. The only noise is the hum of the motor and a slight singing of the water as it rushes through the pipes and valves.

The advantages are that it is a one-man shovel and does not require a craneman or a fireman. The current pull from the line has no large peaks and when the shovel is not in operation the current can be shut off entirely and the pump stopped. There is very little to wear out except the dipper lip and the packing. The control of the movements of the shovel is smooth and accurate. If it is desired to raise or lower the boom for rail transportation it can be done in a few minutes by resting the dipper on the ground and either thrusting or the reverse. It is practically noiseless and clean.

Ship Tin Ore

The initial shipment of tin ore recently made from Bolivia to the new plant of the American Smelting & Refining Co., Perth Amboy, N. J., constitutes the first step to establish the tin smelting industry on a large scale in the United States. The new plant will not only smelt the impure ores from Bolivia and other countries, but will refine the product by the electrolytic process. Heretofore nearly all the tin ore from Bolivia has been shipped to plants in Germany and England. William Loeb, of the American Smelting & Refining Co., in a letter to Secretary Redfield at Washington, says this country imports about 45,000 tons of tin yearly, and of this about 90 per cent is Straits tin, which is consumed largely in the production of tin plate. The ore is first reduced to the concentrates, which contain as high as 50 per cent metal. This is done at the mines, after which the concentrates are shipped to producers of pig iron, where the pure tin is extracted. The new smelting plant cost $100,000.

Officers and department heads of the Carbon Steel Co., Pittsburgh, recently held a dinner at the Fort Pitt hotel, that city. Charles McKnight, president of the company, talked on Co-operation.

Auto Price Advanced

Manufacturer Relates Reasons for Increased Cost of Machines

The announcement of an increase of $100 in the price of the Chalmers touring car, from $1,350 to $1,450, effective March 1, made at the recent Chicago Automobile Show by the Chalmers Motor Co., Detroit, is expected to be followed by similar action by other companies in the industry.

"Raw materials have advanced in price to new high levels in the last few months and the end is not yet in sight," declares Hugh Chalmers. "I predict a general upward revision of motor car prices all along the line before many months. There is no other way out for the automobile manufacturer.

"The European war has been responsible in a great degree for the big increase in the costs of raw materials. The tremendous demand for steel, copper, tin, lead, aluminum, sheet metals and other materials for use in the manufacture of war munitions has made prices high and deliveries uncertain.

"Vanadium steel, which sold at $1.85 a pound only a year ago, has jumped to $8.50 a pound. Aluminum has nearly tripled in price, going from 19 cents a pound to 53 cents a pound. Other sensational increases are steel bars, from $1.10 a hundred to $2 a hundred; high speed steel, from $1.05 a pound to $3.35; and copper, from 14 cents a pound to 24 cents a pound.

"Added to the many troubles of the motor car maker is the difficulty in obtaining machine tools and automatic machinery of the latest type. Factories turning out shrapnel and other munitions of war have practically corralled the output of the machinery makers.

"Steel mills are making no promises of delivery within the six months period and parts manufacturers are accordingly held up in their production. Almost every concern in the metal industry is turning down orders, having accumulated sufficient to keep them at top speed for months to come.

"The situation can result in only one thing—higher prices on cars. If we find that materials continue to climb after the $100 increase in price on our car has taken effect we will undoubtedly be compelled again to raise the price."

Buys Machine Business

The Nashville, Tenn., Machine Co. has taken over the plant and business of the Atlas Machine Co., of Nashville, owing to the fact that Keith, Simmons & Co., wholesale hardware dealers, and large stockholders in the Atlas company, who recently purchased the hardware jobbing business of J. H. Fall & Co., desired to devote all of their time to that enterprise. The Atlas equipment will be installed in the plant of the Nashville Machine Co., which is now said to have one of the largest businesses of the kind in the south. T. C. Keeling is superintendent and general manager.

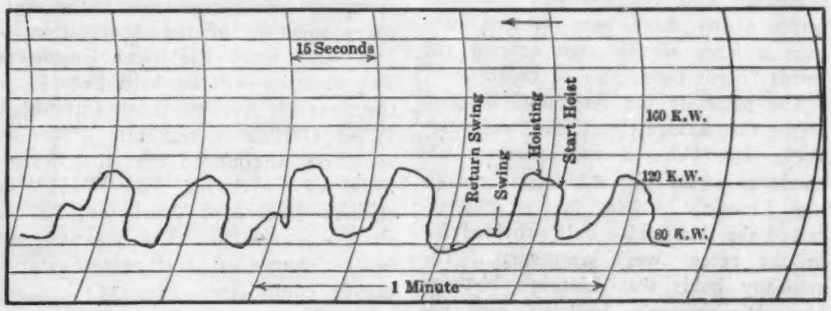


FIG. 9—WATTMETER RECORD SHOWING POWER CONSUMPTION AND SPEED OF SHOVEL OPERATION

Changes Name

The International Acheson Graphite Co., Niagara Falls, N. Y., has changed its name and hereafter will be known as Acheson Graphite Co. It will be noted that the word International has been dropped and that the company's name now begins with the name of the noted inventor of the process for making graphite artificially in the electric furnace. The change was brought about through the conception that the word International had no significance in the company's business and only served to conceal the identity of the company when indexes and other references were examined for the name and address.

Samuel E. Duff, consulting engineer, Pittsburgh, now is located at room No. 1204 Empire building, that city.

News of Employers and Employes

Machinists' Campaign for Eight-Hour Day in New England Has Been Inaugurated

THE machinists' union campaign for an 8-hour day starts in New England this week, 24 cities in Massachusetts, Rhode Island and Connecticut being included in the itinerary for a speaking tour for organizers and national officers of the international association. The itinerary includes: Boston, Lawrence, Mass., Lowell, Mass., Fitchburg, Mass., Greenfield, Mass., Holyoke, Mass., Springfield, Mass., Westfield, Mass.; Torrington, Conn., Waterbury, Conn., Derby, Conn., Naugatuck, Conn., New Haven, Conn., Worcester, Mass., and other cities. Ten speakers will be available for the meetings, which will be open to all machine shop workers in the respective cities. Worcester will be the headquarters of the campaign and the Flatiron building, where rooms have been secured, will have a large electric sign bearing the words "Eight hours", on its front.

The plant of the American Graphophone Co., Bridgeport, Conn., was practically idle Feb. 12, because the 2,000 employes would not work on the holiday, Lincoln's birthday, unless they received the time and a half provided for in the recent wage agreement. The company holds that Lincoln's birthday and Washington's birthday are not holidays. The employes, holding a contrary view, refused to go in, but they resumed work, as usual, Feb. 14.

The American Wringer Co., Woonsocket, R. I., employing nearly 700 men, has granted its employes a 5 per cent raise in wages, effective Feb. 7. It was the result of a conference of a committee of the employes and General Superintendent Jesse P. Walsh.

The first labor trouble for many years in Danby, Vt., developed Feb. 10, when about 125 employes of the Vermont Marble Co., quit work, causing a shutdown of three quarries. The men demanded a nine-hour day and 25 cents increase in pay.

The Leland-Gifford Co., Worcester, Mass., one of the plants in that city in which there is a machinists' strike, paid its 450 employes a monthly dividend bonus of 12½ per cent, Feb. 9, the officials not caring to make public the amount distributed.

An increase of time schedules to a 9-hour day, instead of the 24 to 48 hours weekly, in force for a considerable period, became effective Feb. 14, in the Readville, Mass., and New Haven, Conn., shops of the New York, New Haven & Hartford Railroad Co. It is a partial adjustment of the demands of representatives of several organized trades.

The Bullard Machine Tool Co., Bridgeport, Conn., announces a 10 per cent increase in wages, to take effect at once, in all is departments. The change will effect 1,300 employes, who are working on three shifts a day, turning out tremendous orders for the company.

Talk on Compensation

L. H. Burnett, assistant to the president of the Carnegie Steel Co., Pittsburgh, and L. R. Palmer, of the department of labor and industry of Pennsylvania, will talk about the New Workmen's Compensation Act and Insurance Requirements at the February meeting of the Association of Iron and Steel Electrical Engineers. The meeting will be held Feb. 19, at the Seventh Avenue hotel, Pittsburgh. W. O. Oschmann, secretary of the association, announced that the Present State of Purchased Power in Relation to Steel Mill Work will be discussed March 18. The meeting will be in charge of the central station power committee. Stewart C. Coey, of the Youngstown Sheet & Tube Co., who is chairman of the electrical development committee, will have charge of the April meeting, which will be devoted to a consideration of the more recent developments in electrical apparatus and appliances.

Talks on Labor Situation

H. H. Rice, president, National Metal Trades Association, was the guest of honor at the annual banquet and meeting of the Milwaukee Metal Trades and Founders Association at Milwaukee last week. Mr. Rice devoted his remarks to the labor situation. He declared that strikes of the past year have been due to the work of agitators. Mr. Rice advised employers who sincerely believe they are dealing fairly with their employes on the wage question, to take no hurried action when a strike is threatened. In a majority of cases, he said, the men will come back to work, as they usually were induced to strike by labor union agitators. However, Mr. Rice urged employers who are not dealing fairly with their men to do so at once. Workmen are entitled to get their share of improved conditions, he stated, and the employer who is not fair in his treatment of men is only plowing ground for the agitator. William W. Coleman, president, Bucyrus Co., South Milwaukee, was elected president of the association, and Richard P. Tell, vice president and general manager, National Brake & Electric Co., Milwaukee, vice president. William J. Fairbairn was re-elected secretary and treasurer, as well as manager of the employment bureau. The offices will shortly be moved from the Hathaway building to the University building, Mason street and Broadway.

Would Employ Many More Men

Detroit, Feb. 15.—The announcement, made by Henry Ford during the past few days, that the size of his Highland Park motor car plant would be tripled, has caused a lot of speculation in Detroit industrial circles—as well as other channels of trade—as to just what this concern and its sister factory—the Ford Tractor plant in Dearborn—means to the future life of the city. The Ford motor car factory will, when plans are completed and construction work is finished, cover an immense area and will give employment to 100,000 persons. The Ford tractor plant will be employing more than 20,000 persons in three years. This means an addition of 100,000 workmen (there are approximately 20,000 employes in the two plants now) and figuring on the basis of five persons to the family, this means an additional population of 500,000 alone. It means that Detroit, in 1920, will have passed the 1,000,000 mark by a good margin. It means that this city will probably take rank as the fourth—and perhaps the third—city in the country.

Takes Over Plant

The Curtiss Aeroplane & Motor Co., Buffalo, N. Y., has purchased the Marblehead, Mass., plant of the Burgess Co., for approximately $1,000,000, partly in cash and partly in securities of the Curtiss Co., of which W. Sterling Burgess, president of the Burgess Co., becomes a director. There will be no reorganization of the Burgess Co., which will continue business under its present staff. The Curtiss Co., through this purchase, becomes one of the largest domestic producers.

Iron and Money: Fact and Comment

Wonderful Gain in Earnings by the Lackawanna Steel Co.

—Large Volume of Unfilled Tonnage

FURTHER evidence of the remarkable transformation of lean earnings or deficits into extraordinary profits, is furnished by the statement of its income account for the calendar year of 1915, issued by the Lackawanna Steel Co. Net earnings during the past year were increased from $1,581,378 to $5,977,470, an increase of $4,396,092, or about 400 per cent. A deficit of $1,652,445 in 1914 was changed to a profit of $2,409,108 in 1915, equivalent to 6.93 per cent on the $34,763,400 in common stock outstanding. Fourth-quarter profits in 1915, which by far were the largest of the year, were $1,795,758, or at the rate of 20.66 per cent, per annum, for the outstanding stock. Because of its very liberal income, the company has elected to redeem at 101 on March 31, the entire issue of $6,000,000, 6 per cent, 2-year, gold notes, issued on March 1, 1915. A comparative income account of the company for the past three years, is as follows:

	1915.	1914.	1913.
Gross sales..	27,792,935	16,281,689	29,879,275
Net earn....	5,977,470	1,581,378	6,605,762
Inter., rents & royalties.	2,044,719	2,167,186	2,187,671
Surplus	3,932,750	†585,808	4,418,091
Dep. & ren..	1,523,642	1,066,637	1,662,208
Surplus	2,409,108	†1,652,445	2,755,883
Spec. profits.	.....	.....	267,200
Surplus	2,409,108	†1,652,445	3,023,083
Divs.	.....	350	347,526
Surplus	2,409,108	†1,652,795	2,675,557
Prev. surp..	5,777,457	7,514,876	4,839,319
Fire loss....	.....	84,625	.....
P. & loss sur.	8,183,565	5,777,457	4,839,319

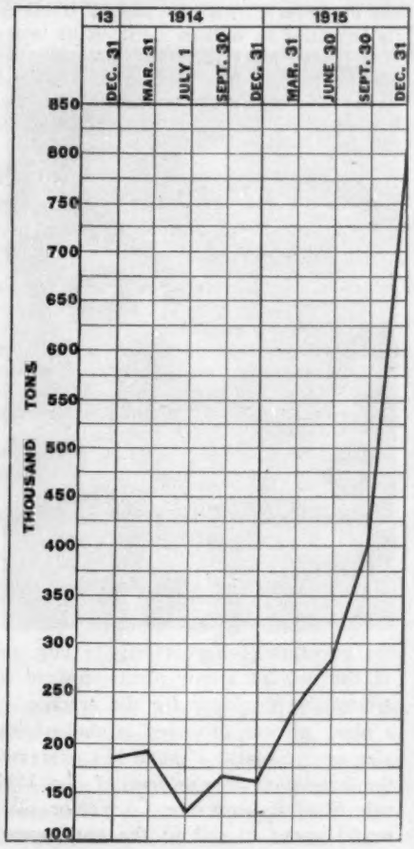
†Deficit.

An impressive showing is made by the increase of unfilled orders of the company. In the year from Dec. 31, 1914, to Dec. 31, 1915, the unshipped business rose from 160,160 tons to 812,680 tons, a gain of 652,520 tons. Of this gain, 419,596 tons fell during the last quarter. The unfilled orders of the company at the end of each quarter for the past several years, is as follows:

Dec. 31, 1915.....	812,680
Sept. 30, 1915.....	393,084
June 30, 1915.....	283,979
Mar. 31, 1915.....	229,910
Dec. 31, 1914.....	160,160
Sept. 30, 1914.....	166,344
July 1, 1914.....	128,880
Mar. 31, 1914.....	191,828
Dec. 31, 1913.....	185,427

Shows Improvements

The annual statement of the Nova Scotia Steel & Coal Co. for 1915 shows net profits of $2,094,169 after writing off betterments to plant and providing for depreciation, while, with $57,466 carried forward from the preceding year, made the total amount available for distribution $2,151,636. After the payment of sinking fund and interest requirements, including $123,600 on preferred stock, a balance of $1,510,609 was carried forward. The general statement of assets and liabilities shows current assets of $5,015,890, as compared with $2,777,606 at the end of 1914, and current liabilities of $1,866,378, as compared with $2,522,723, showing a total improvement in liquid position of $2,994,629. The directors reported that the Eastern Car Co., a subsidiary had also had a profitable year. Profits for the year ending Nov. 30 amounted to $359,746.



UNFILLED TONNAGE OF LACKAWANNA

Industrial Stocks

Iron and steel stocks for the most part, made advances last week, but the general stock market for the past two weeks has not shown any decided trend either up or down. The *New York Evening Post* has dug up the history of the month of February for a number of years and shows that it has been a time of uncertainty. Going back as far as 1901, the year of the organization of the Steel corporation, the story of February was of an uncertain market influenced by fear of the Steel Corporation's prospective power. As recently as 1915, February was a dull and despondent period, with some stocks down to the lowest notch since the war started. In present conditions, there is no cause for alarm, and probably March will see a more active market. During the past week sales of Cambria Steel amounted to 284,475 shares. The week's range of prices was from 75 to 80⅝, and the last sale price was 80½. The par value is $50.

Quotations at the close of business Feb. 11 and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close Feb. 11.	Net chg.
American Can	62⅞	+1¼
American Can, prfd.....	110⅞	+ ⅜
Amer. Car & Fdy.....	73⅛	+6
American Locomotive	67¾	+1¾
American Locomotive, prfd..	103	+1
American Steel Foundries...	57½	+2⅞
Baldwin Locomotive	114	+1¾
Baldwin Locomotive, prfd...	109	+1
Bethlehem Steel	471	+1
Bethlehem Steel, prfd.....	137	+7
Colorado Fuel & Iron.....	47⅜	+2⅞
Continental Can	81	+2¼
Crucible Steel	81¼	—1¾
Crucible Steel, prfd.....	115	—1¼
General Electric	171⅜	+ ⅜
Inter. Harv. of N. J.....	110¾	+ ⅜
Inter. Harv. Corp.....	70	—3
Inter. Harv. Corp., prfd.....	107	—1
Lackawanna Steel	79¾	—1⅜
Nat'l Enam. & Stamp. Co...	28½	+3¼
Nat'l En. & Stmp. Co., prf..	97	+1
Pressed Steel Car.....	58⅞	+3⅜
Pressed Steel Car, prfd.....	102¾	+1⅜
Pullman Palace Car.....	164	—1
Republic Iron & Steel.....	54¼	+1¼
Republic Iron & Steel, prfd.	110	.....
U. S. Cast Iron Pipe & Fdy.	20	+1⅜
U. S. C. I. P. & Fdy., prfd.	49¾	+1¼
United States Steel.....	84⅞	+1⅛
United States Steel, prfd....	117¼	+1¼
Westinghouse Mfg.	67⅜	+1⅜

The following table shows changes in maximum quotations of stocks not listed on the New York exchange:

	High Feb. 11.	High Feb. 4.
American Radiator	397½	400
American Ship Building.....	39½	39
Cambria Steel	80⅜	75⅝
Chicago Pneumatic Tool.....	75	74¼
Inland Steel	365	.....
LaBelle Iron Works.....	51	51½
Lake Superior Corpn.....	10¾	9⅛
Pennsylvania Steel	63	.....
Stewart-Warner Speed. Co...	88¼	88¼
Warwick Iron & Steel Co....	10¾	10¾
Westinghouse Air Brake.....	137	136
Westingh'se Elec. & Mfg. Co.	68⅜	67½

The National Art Bronze Works has established a plant at 2337 Pope avenue, St. Louis. This concern, which was formerly known as the Alloyed Metal & Mfg. Co., specializes on ornamental and architectural bronze castings, including statuary of all sizes, bas relief panels, tablets, etc.

Business News of Nation's Capital

Senate Commitee Favors Building or Buying Armor Plate Plant—Chamber of Commerce of United States Acts Upon Many Important Matters

Washington, Feb. 15.
The Iron Trade Review Bureau,
206 Corcoran Bldg.,

THE report made to the senate last week by the senate committee on naval affairs urging favorable and quick action on the administration's substitute armor plate bill has been accepted as an amazing document and is in line with the the remarkable proposal that the government make its own armor.

Among the curious statements appearing in the report is the following:

"Should the government build it (armor plate plant) and then lock it up, and it never be used, it would be wise to erect it, as it would serve as a warning to private manufacturers that there is a point beyond which the government will not be driven and where patience ceases to be a virtue."

The ridiculous theory carried in the foregoing extract not only shows its economic absurdity, but blithely overlooks the fact that the government itself would monopolize the armor plate industry inasmuch as private makers have told the committee they would be forced out of the business if the government enters it. The government, therefore, would be compelled to operate as best it could.

Attacks such as armor plate manufacturers have been subjected to at the hands of an element in congress are contained in the report, which was evidently prepared by Senator Tillman, chairman of the committee. Despite the showing to the contrary made by armor manufacturers at the recent hearing before the committee, the report insists that they have made excessive profits from armor plate contracts with the United States government and says "a condition has existed little short of scandalous." At another point, it is asserted that, "As long as present conditions continue the armor manufacturers are in a position to force the United States government, in the language of the highwayman, to 'stand and deliver'." These expressions are typical of others which are sprinkled throughout the report.

Referring to the recent hearing the report says:

"The hearing before the committee brought out no new facts. The armor men of 1916 showed the same capacity for talking without saying anything as that exhibited so artistically by their brethren of earlier years. The same talk of the 'value of trade secrets'; the same reluctance to talk cost of production; the same plea of having been encouraged by the government to go into the business and the consequent unfairness of government competition; the same inability to recognize that if such a quasi partnership as they claim exists between them and the government, they should shoulder its liabilities as well as insist on its benefits; indeed, about the only material difference between the hearing of 1916 and those other numerous ones that have followed each other so regularly and so fruitlessly since 1895 is that of dates."

The substitute measure, offered by Senator Chilton, of West Virginia, was adopted by a vote of nine to three, and reads as follows:

"That the secretary of the navy is hereby authorized and directed to provide, either by the erection of a factory, or by the purchase of a factory, or both, for the manufacture of armor for the vessels of the navy; said factory or factories to have an annual capacity of not less than 20,000 tons of armor; and the sum of $11,000,000 is hereby appropriated out of any money in the treasury not otherwise appropriated to be immediately available for the purpose of this act."

Tillman Wants Midvale

The substitute was designed to give the government opportunity to buy one of the private armor plants, instead of arbitrarily providing for the erection of a plant, as was proposed in the original measure. Senator Tillman has expressed the hope that the owners of the Midvale Steel & Ordnance Co. armor plant would agree to sell to the government, which would enlarge it. The Midvale plant has an annual capacity of 8,000 tons. No official or member of congress has given any assurance that a private plant could be purchased. Senator Tillman wants the plant to be located at Philadelphia and that is given as one reason why he favors purchase of the Midvale plant.

National Chamber's Resolutions

Washington, Feb. 15.—Included among the more important matters taken up at the fourth annual convention of the Chamber of Commerce of the United States in this city last week were committee reports relating to national defense, the merchant marine, a tariff commission, vocational education and labor exchanges. Resolutions were adopted with regard to dumping legislation, industrial efficiency, industrial protection and the railroads.

It was resolved that the national chamber petition the President and congress to take prompt action to refer the question of dumping legislation to such governmental agency as is best equipped to ascertain all facts in the case and base thereon all necessary legislation in order to prevent such abnormal foreign competition; another resolution, reaffirming the previous position of the chamber, urged congress to reject such rider legislation as was passed at the sixty-third congress preventing the study of methods to increase industrial efficiency in manufacturing establishments of the government and to forbid additional compensation to employes as a reward for improvement in skill and effort; another resolution requested that congress make an investigation through an appropriate agency to ascertain the industries which in the national public interest should be developed and enact legislation to promote its development, the design being to encourage the production or manufacture of goods which now are produced or manufactured in this country to a limited extent; another resolution, dealing with the impending railroad strike, urged the parties to the controversy to settle their differences without recourse to measures that would impair the public interest and authorized the board of directors of the chamber to appoint a committee to make careful investigation of the situation and report to the board as to the best means of protecting the public service.

The report of the committee on national defense recommended the passage of legislation which will permit the organization of a "staff of industrial mobilization", the functions of which would be to gather data as to the character and quantity of munitions and supplies required, the tools of industry available to produce them and the means of making these tools effective through legislation, organization and training.

The committee on merchant marine, of which William H. Douglas, New York, is chairman, criticised vigorously the administration ship purchase bill and reiterated recommendations it made last year for legislation to build up the American merchant marine.

Is Honored While Abroad

American Institute of Mining Engineers Chooses as President, Dr. L. D. Ricketts, Now in South America

Dr. L. D. Ricketts, who was recently chosen president of the American Institute of Mining Engineers, enjoys the distinction of having been elected to this office while on another continent. He now is in South America, where he is making a tour of inspection of several mining properties in Chile and other countries. He is expected to return to the United States in April. Dr. Ricketts' life history is one of achievement, and in recent years he has been the recipient of unusual honors in recognition of his pre-eminence in the mining engineering field: Last year he was selected by a committee appointed by the governor of Arizona as that state's most notable citizen, and in this capacity he presided over the Arizona Day ceremonies at the Panama-Pacific exposition, San Francisco, Nov. 18, 1915. Dr. Ricketts has been an unusually active traveler, his work taking him to practically all quarters of the globe where valuable mineral deposits were to be found. His New York office is at 42 Broadway, his residence being at Warren, Ariz., where he spends most of his time.

Dr. Ricketts was born at Elkton, Md., Dec. 19, 1859. He was graduated as a bachelor of science from Princeton university in 1881, and was fellow in chemistry and economic geology at Princeton from 1881 to 1883, receiving the degree of doctor of science in the latter year. He was a surveyor and mine superintendent in Colorado from 1883 to 1885, and 1887 to 1890 acted as state geologist in Wyoming. In 1890 he became consulting engineer for Phelps, Dodge & Co., having charge of all of that company's properties in the southwest. Dr. Ricketts still continues this association. Since 1906 he has acted as consulting engineer for the Cole-Ryan interests, which include the Anaconda Copper Mining Co., Greene-Cananea Copper Co., Inspiration Consolidated Copper Co., International Smelting Co., Raritan Copper Works, etc. He is president and director of the Cananea Consolidated Copper Co., Cananea, Sonora, Mexico; president and director of the Morenci Water Co., Morenci, Ariz.; president of the Tucson, Cornelia & Gila Bend Railroad Co.; vice president of the Valley Bank, Phoenix, Ariz.; consulting engineer for the Calumet & Arizona Mining Co., Bisbee, Ariz.; vice president and director of the Gila Valley Bank & Trust Co. of Arizona; director of the Inspiration Consolidated Copper Co.; and recently was elected director of the New Cornelia Copper Co., which is developing a huge property at Ajo, Ariz. Dr. Ricketts is a regent of the University of Arizona. He is a brother to Palmer C. Ricketts, president of Rensselaer Polytechnic Institute, Troy, N. Y. Dr. Ricketts is a member of the American Society of Civil Engineers and of the

DR. L. D. RICKETTS

Institution of Mining and Metallurgy of Great Britain.

The new vice presidents of the American Institute of Mining Engineers are Dr. Karl Eilers, 120 Broadway, New York, and James MacNaughton, Calumet, Mich. The following were elected to succeed retiring directors: Thomas B. Stearns, Denver; Charles F. Rand, New York; Charles W. Goodale, Butte, Mont.; Edwin Ludlow, Lansford, Pa., and George D. Barron, New York.

Can't Leave It Alone

Vernon F. Prentice, for many years of Prentice Bros., machine tool makers, Worcester, Mass., whose business was absorbed by the Reed-Prentice Co., in 1912, has started up again in the same room in the French building, 54 Hermon street, that city, in which Francis E. Reed and himself laid the foundation of the big business of the company bearing their names, 42 years ago. Mr. Prentice is to make lathes and other machine tools and steps are being taken to organize a Massachusetts corporation to carry on the business. His brother, Harry V. Prentice, formerly of the old firm, will be associated with him. When the consolidation of the Reed and Prentice interests was effected both Mr. Reed and Vernon F. Prentice retired with fortunes, Mr. Reed being rated a millionaire. Mr. Reed is content to live a retired life, but Mr. Prentice isn't.

It was in April, 1875, that Mr. Reed purchased a half interest in the business then carried on by Albert F. Prentice, making engine lathes, six men being employed. The business grew from those six men to 1,600, but that number is not now employed by the company because of the machinists' strike.

The new company is planning to make three machines. The shop is being equipped with machinery and men are being engaged to operate it.

Takes Orders to Build

The Moore & Scott Iron Works, San Francisco, has signed a contract with Hind, Rolph & Co., for a steel freighter, 7,200 tons dead weight capacity, equipped with Curtis turbine and Scotch boilers. The company has also signed a contract for a duplicate of this vessel with the Port Costa Steamship Co., of which the G. W. McNear Co., of San Francisco, is controlling owner. The first vessel is to be delivered Dec. 31, 1916, and the second March 31, 1917. The cost of the two vessels will be about $1,500,000. In order to take care of these contracts, the Moore & Scott Iron Works has spent about $150,000 in improvements in its yard at Oakland, Cal., building a new punch shed, 45 x 160 feet, in which it is installing ten new Cleveland punches, all direct motor-driven, also a set of rolls 25 feet long, together with other improvements which will make the yard one of the most modern on the coast. The company is also figuring on other vessels and expects to close on one or more contracts in the near future.

Martin E. Dewstoe, of the Dewstoe Machine Tool Co., Birmingham, Ala., has qualified as receiver of the Great Southern Automobile Co., Birmingham. The latter concern was organized several years ago and was capitalized at $120,000. For the past two or three years, it has manufactured no automobiles. Recently the company started to manufacture lathes.

Machine Tool Buying Takes Slump

Domestic and Foreign Business Falls Off—Temporary Lull in East Counterbalanced by Activity in Central States—Pittsburgh Builders Busy

THE machine tool market displays considerably less activity this week. While inquiries are still plentiful, the amount of business being booked is comparatively small. Export orders are unimportant, and about the only foreign buying is that of the Russian commission. There has been exceedingly little buying by England or France during the week. Domestic business is of fair proportions, but there are no large transactions to report. The demand from the ship building companies which recently was so pronounced, has fallen away, while the railroads now are ordering only an occasional tool. A large amount of new construction, however, is planned for spring, so that considerable additional buying is believed to be in prospect.

The Wickwire Steel Co. is purchasing equipment for the new steel plant it is about to erect in Buffalo. The contracts, which have already been let, involve one 150-ton ladle crane, one 50-ton and four smaller electric traveling cranes, all of which went to the Alliance Machine Co., Alliance, O.; also one charging machine, to be built by the Wellman-Seaver-Morgan Co., Cleveland.

Among concerns in the east, which are expanding their capacity, are the United Smelting & Aluminum Co., New Haven, Conn.; American Body Co., Buffalo; New York Steam Co., New York; Westinghouse Lamp Co., Watsessing, N. J.; Victor Talking Machine Co., Camden, N. J.; Standard Engineering Co., Waterbury, Conn.; New London Ship & Engine Co., Groton, Conn.; International Fuse Co., Bloomfield, N. J.; Frank Toomey, Inc., Philadelphia; Autocar Co., Ardmore, Pa.; Bridgeport Brass Co., Bridgeport, Conn.; Porcupine Boiler Co., Bridgeport, Conn.; Turner Tanning Machinery Co., Peabody, Mass.; Baldwin Locomotive Works, Philadelphia, and the Reece Buttonhole Machine Co., Boston.

Chicago Unable to Secure Machines

THE ONLY bar to tremendous business on the part of machine tool dealers in Chicago is their inability to obtain a sufficient number of machines. Domestic users are seeking equipment and this class of sales is growing steadily. Export inquiry is uncertain, some dealers feeling that it is reviving after a decided lull in January, and others believing it has dropped off definitely. In any event, it is not expected to exhibit its former strength. Considerable competition was manifested at the recent sale of the plant of the Rayfield Motor Co., Chrisman, Ill. About 35 modern tools were offered and were taken mostly by New York dealers. A dozen of the machines were bought by the E. L. Essley Co., Chicago. A Wisconsin manufacturer building dairy machinery is erecting a large machine shop addition and is in the market for a considerable list of tools.

Pittsburgh Market Continues to Improve

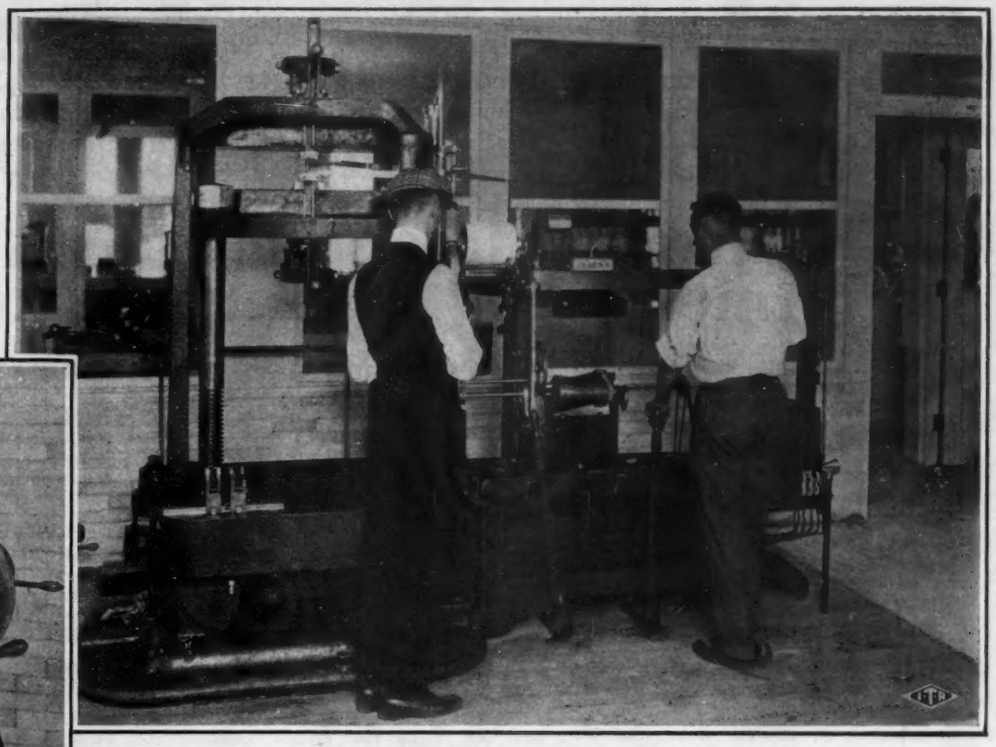
BUYING of machinery for the domestic trade continues to increase in the Pittsburgh district. Builders of punches and shears in the central west are enjoying almost unprecedented demand, as a result of the revival in ship building along the Atlantic seaboard and the Great Lakes. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has just closed for a 66-inch shear for shearing ¼-inch plates and the American Sheet & Tin Plate Co. has closed for a large punch end shear for its new plant at Gary, Ind. The Carnegie Steel Co. is closing contracts for four mill cranes for the Duquesne Steel Works, Duquesne, Pa., and will soon purchase about 20 cranes for its new plant at McDonald, O. The Standard Mfg. Co., Kenova, W. Va., has entered the market for woodworking machinery, hydraulic presses, dies, heavy-duty pumps, gas engines, an electric dynamo and auxiliary equipment. Some of the more important builders of cranes now are unable to promise deliveries in less than seven months.

Cleveland Market Steady

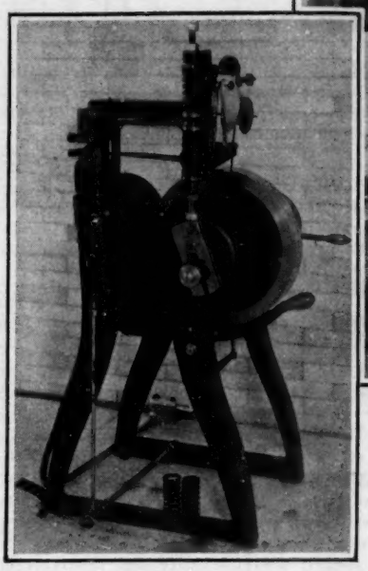
THE machine tool market in Cleveland is strong, inquiries for second-hand machines being particularly numerous. Automobile builders, who had planned on an increased production for the year are handicapped by the shortage of equipment and are further inconvenienced by delayed deliveries. One Detroit builder has placed an order for special purpose lathes, stipulating delivery during 1916, and paying a premium for the guarantee. A local machine tool builder has received an inquiry from the Whittaker-Glessner Co., Wheeling, W. Va., which is in the market for a number of tools, including hammers, gear cutters, boring mills, high-speed and radial drills, milling machines and hydraulic presses. This equipment will be installed at its Portsmouth, O., plant.

Cincinnati Shops on Full Time

IN CINCINNATI, striking machinists are making strenuous efforts to regain some of the ground lost during the past month, but the machine tool builders, against whom the strike was originally directed, appear to have the situation well in hand. Every shop is now running with full forces and production is again approaching the highest level ever



Making a Tensile Test



Our Toughness Determining Machine

No Chance for Self Deception--

Our laboratory contains machines that measure accurately the strength, toughness and elasticity of "Agathon" Steel.

Every heat is tested, and our operators have no opportunity to lull themselves into a feeling of false security. ¶ They know the cold facts about every ton—and the customer knows them too. "Agathon" Service and Quality also provide *Protection.*

AGATHON STEELS

WILL SERVE YOUR PURPOSES *BEST!*

WE MAKE

"AGATHON" Chrome Nickel
"AGATHON" Chrome Vanadium
"AGATHON" Nickel Steels
"AGATHON" Special Analyses
"AGATHON" Vanadium
"AGATHON" Silico-Manganese
"AGATHON" Chrome Steel
"AGATHON" High Carbon

THE CENTRAL STEEL COMPANY

MASSILLON, OHIO

Detroit Office: 326-27-28 Ford Bldg.
Cleveland Office: Hickox Bldg.

F. Walter Guibert, District Representative
The Hamill-Hickox Co., District Representative

AGATHON STEELS

Say you saw it in THE IRON TRADE REVIEW

attained, operations being about 10 per cent above normal. Any builder of tools who can promise immediate delivery may secure unlimited contracts from abroad for lathes and drill presses. Manufacturers, however, are showing a strong preference for domestic business, and the majority of sales are to domestic users. The Joseph Joseph & Bros. Co., Cincinnati, has increased its capital stock from $400,000 to $2,000,000, and will buy several locomotive cranes. The M. L. Andrew Co. is planning an addition to its plant and the Regal Machinery Co. will be in the market shortly for light equipment. The new plant of the Kings Powder Mills, Kings Mills, O., will be ready for installation of machinery in about 30 days.

Among New England Factories

LEWISTON, ME.—The Lewiston Concrete Co. has been incorporated by Chandler Barren and Frank W. Winter. The company will build a factory and make cement blocks for building purposes.

SOUTH GORHAM, ME.—Capt. T. M. Block is erecting a dynamite plant, consisting of eight separate buildings, near the Westbrook line, which will cover 10 acres. The capacity of the plant will be 2 tons of dynamite per day.

WINSLOW, ME.—The Star Instrument Co. has been incorporated to make mechanical and electrical devices and appliances; $100,000 capital stock; by Robert H. Montgomery, Boston, M. E. Hegarty, Winthrop, Me., and George K. Bassett.

FRANKLIN, N. H.—The Commercial Machine Co., Boston, incorporated recently with a capital stock of $300,000, has taken over the Webster street factory formerly occupied by the Arthur N. Ames Knitting Machine & Needle Co., and will erect a 36 x 56-foot addition. New machinery will be installed. The temporary officers have been succeeded by Arthur N. Ames, president; George L. Hancock, vice president; Herrick Aiken, treasurer, and Ralph B. Griffin.

MANCHESTER, N. H.—The Willard H. Griffin Shoe Co. will build a $30,000 addition to its factory on Grove street, which will double its capacity.

ST. JOHNSBURY, VT. — The Fairbanks-Morse Co., Chicago, is conducting negotiations to acquire the scale manufacturing plant of E. & T. Fairbanks & Co. here. It is expected the deal will be concluded successfully about March 1. The Fairbanks-Morse Co. plans to continue the manufacture of scales and other products here, materially enlarging the output.

AMESBURY, MASS.—E. R. Sipson, architect, 176 Federal street, Boston, is drawing plans for a foundry and office building to be erected in Amesbury at a cost of about $50,000. The owner's name is withheld.

AMHERST, MASS.—Amherst college will build a brick and stone 3-story library building to cost $250,000.

BOSTON.—The Reece Buttonhole Machine Co. is expanding its capacity.

BOSTON.—The T. C. Brooks Co., sheet and metal worker, has been incorporated; $5,000 capital; by Thomas C. Brooks, J. A. Haley and F. B. Haggett.

BOSTON.—The Columbus Motor Car Co., has been incorporated; $25,000 capital stock; by Margaret G. Moore, Leroy P. Russell and Peter J. Maguire.

BOSTON.—The Chalmers Motor Car Co. of New England has been incorporated; $25,000 capital stock; by Frank M. Sawtelle, Robert Jackson Cram and Atherton N. Hunt.

BOSTON.—A contract has been awarded for a brick, stone and steel, 2-story, 96 x 105-foot building to cost $100,000 for a post office station at 258 Huntington avenue.

BOSTON.—The Builders Foundry Co. has been incorporated; $5,000 capital stock; by H. B. Skinner, Herman S. Tay and L. A. Brimmer.

BOSTON.—The Globe Specialty Co. has been incorporated; $50,000 capital stock; by Alexander T. Walker, William P. Walker and M. S. Coggan.

BOSTON.—A contract has been awarded by David J. Donahue and Alfred H. Howard, for a brick and steel, fireproof, 3-story, 51 x 58-foot building to cost $75,000 at Harrison avenue and Beach street.

BOSTON.—The MacKenzie & Temple Co. has been incorporated as general contractor and builder; $50,000 capital stock; by Charles A. MacKenzie, Charles C. Temple and E. E. McConnell.

BOSTON.—The Metropolitan park commission will build two bridges spanning the Charles river, one at Weston to cost $50,000; other on North Beacon street, near the Watertown arsenal, to cost $118,000. Both will be of concrete, three spans each.

CHELSEA, MASS.—The J. Lipsitz Co. has made considerable improvements to its yard for handling different lines of iron and steel scrap. Additional equipment is planned including shears, track scales, locomotive cranes and lifting magnets. The Maine Electric Co., Portland, Me., was recently awarded a contract for a 30-ton electric hoist.

HAVERHILL, MASS. — The plant of the Haverhill Safety Gas Light Co. has been converted into a shop for the making of primers for cartridges which are to be exported.

HOLYOKE, MASS.—The Holyoke Covered Wire Co. plans to extend its plant from Front to Dwight streets.

HOLYOKE, MASS.—The Hampden Munitions Co., has been incorporated; $50,000 capital; by John T. Murphy, Patrick P. Murphy, Chicopee, and T. J. Sheridan.

HOLYOKE, MASS.—The G. Haarman Co., structural iron worker, will build a 1-story, 48 x 72-foot addition of mill construction in the rear of its present plant on Commercial street, which will be equipped with a traveling crane.

MALDEN, MASS. — The Converse Rubber Co. will build a 4-story and basement factory addition, 72 x 150 feet, to cost approximately $75,000.

MANSFIELD, MASS.—The Walker, Davison Co. has been incorporated to make pens; $50,000 capital stock; by J. J. Thacher, Philip S. Walker and W. E. Jamieson.

NEWBURYPORT, MASS.—The Newburyport Gas & Electric Co. will build a $200,000 power station on the Fiberloid Co.'s wharf, which it recently acquired.

READING, MASS.—The Cosmin Rubber Mfg. Co. has been incorporated; $10,000 capital stock; by Frederick S. Bryant, Elizabeth M. Bryant and Arthur White.

SOMERVILLE, MASS.—The Massachusetts Steel Products Co. has been incorporated; $5,000 capital stock; by John J. Hurley, J. J. Lawler and M. R. Hurley.

SPRINGFIELD, MASS.—Bids have closed for a brick, fireproof, 4-story 63 x 174-foot garage and repair shop on Park street, the name of the owner being withheld.

SPRINGFIELD, MASS. — Wm. J. Hyland, 151 Dwight street, is taking bids on the construction of a 1-story and basement, 68 x 203-foot, light manufacturing building, to cost $10,000.

SPRINGFIELD, MASS.—The E. L. Sampson & Bros. Contracting Co. has been incorporated; $21,000 capital stock; by Ernest L. Sampson, Charles M. P. Sampson and George P. Sampson.

WORCESTER, MASS.—The Worcester Tire Fabric Co. has increased its capital stock from $50,000 to $100,000.

WORCESTER, MASS.—The Mafreto Machine & Tool Co. has purchased the property of the former Young Machine & Tool Co., 53 Gardner street, and will continue to use it for its business.

AUBURN, R. I.—The Campbell Textile Machine Co., recently incorporated in Massachusetts with a capital of $200,000, has acquired a large, modern plant in Auburn and has equipped it with machinery and apparatus acquired as a result of the company's purchase of the textile machinery business of the Potter & Johnston Machinery Co., Pawtucket, R. I. Leon W. Campbell, for many years general manager of the Woonsocket Machine & Press Co., Woonsocket, R. I., is president of the new concern.

PROVIDENCE, R. I.—The Franklin Machine Co. has changed hands. The new owners, one of whom E. B. Hough, is president, will install about $50,000 worth of new machinery and double the capacity.

PROVIDENCE, R. I.—The Providence Gas Co. will erect four buildings at Sassafras point, of brick and stone; 2½-story, 57 x 127-foot generator house; 2½-story, 61 x 112-foot purifier house; 1-story, 41 x 66-foot exhauster and pump house, and a 1½-story, 34 x 38-foot tar extractor and washer house.

BRIDGEPORT, CONN. — The Porcupine Boiler Co., 73 Wordin avenue, has started work on a 1-story, 53 x 108-foot boiler shop, to cost $5,000.

BRIDGEPORT, CONN. — The Lindstrom Tool & Die Gauge Works has organized; $20,000 capital stock; by F. L. Lindstrom, Ada Lindstrom and Frances Lindstrom.

BRIDGEPORT, CONN.—The Standard Roofing Co. has been incorporated; $2,000 capital stock; by Henry Weingarten, Elizabeth Cohen and Abraham Stolinsky.

BRIDGEPORT, CONN.—The Annin-Cassidy Building Co. has been incorporated; $50,000 capital; by John M. Cassidy, George L. Cassidy and John E. Annin.

HARTFORD, CONN.—The Taylor & Fenn Co. has increased its capital stock from $100,000 to $200,000.

HARTFORD, CONN.—The Milburn Car Co. of Connecticut has organized; $7,500 capital stock; by Philip S. Wainwright, Thomas A. Stewart and Carl W. Tramtuon, Lakewood, O.

Crawford Ore from the Dean-Itasca Mine on the Mesabi Range

The ore is non-bessemer, of good coarse structure. Dean-Itasca mine shipments for 1915 were 486,374 tons, mostly since August 1. For 1916 they will be considerably greater.

A complete analysis of Crawford Ore from Dean-Itasca Mine in natural state and dried at 212° Fahr.

	Dried 212°	Natural
Iron	58.35	50.2451
Phosphorus	.065	.05597
Silica	6.03	5.1924
Manganese	1.00	.8611
Alumina	3.40	2.9277
Lime	.16	.1377
Magnesia	.12	.1033
Sulphur	.031	.0266
Volatile Matter	5.74	4.9427
Moisture	13.89	

Crawford Ore Guarantee for 1916, 51.50 Per Cent Iron, Natural

The output of this mine during 1916, together with our five other mines, gives us an unusually large tonnage.

We are now taking contracts for this ore and will be glad to figure on your requirements for the coming season.

THE TOD-STAMBAUGH COMPANY

Perry-Payne Building

CLEVELAND :: :: :: :: OHIO

The company has bought the automobile department of the Thomas A. Stewart Co.

MERIDEN, CONN.—The L. Suzio Co. has been incorporated to do a general contracting and construction business; $100,000 capital; by Leonardo Suzio, Frances Suzio and Marjorie Suzio.

NEW HAVEN, CONN.—The Berger Bros. Co. has let a contract for the construction of a 1-story and basement, 38 x 70-foot factory addition.

NEW HAVEN, CONN.—The Appals Construction Co. has been incorporated; $15,000 capital; by Albert H. Powell, F. H. Andrews and L. B. Sperry.

NEW HAVEN, CONN.—Yale University will build a sheet metal or steel, 40-foot high, 100 x 200-foot artillery armory to cost $75,000.

NEW LONDON, CONN.—Dudley S. Donnelly, architect, is preparing plans for a pattern shop and sanitary building, to be erected at Groton, Conn., for the New London Ship & Engine Co. at a cost of about $10,000.

NEW LONDON, CONN.—Edw. Gagel, engineer, New Haven, is preparing plans for a bridge to be erected over the Thames river by the New York, New Haven & Hartford railroad. It will be 1,387 feet long, five spans, two approaches, 1,300 to 1,600 feet, respectively, and will cost approximately $2,500,000. The work is in charge of Division Engineer J. H. Soehrens, New London. Bids for the substructure will be taken till Feb. 23.

NEW MILFORD, CONN.—The New Milford Co. has been incorporated to build machinery; $50,000 capital stock; by Thomas F. Young, John W. Coleman and John E. Higgins.

NORWICH, CONN.—The Peck-McWilliams Co. has been incorporated to do a general contracting business; $45,000 capital stock; by John McWilliams, Harry G. Peck and Frank D. Davis.

ROCKY HILL, CONN.—The Champion Mfg. Co. has leased its machine room to the Alliance Mfg. Co., Bridgeport, which will use it for the making of steel gauges.

WATERBURY, CONN.—The Standard Engineering Co., Center street, is taking bids on the construction of a 1 and 2-story, 25 x 40-foot, shop and garage.

WATERBURY, CONN.—The Richards Mfg. Co. has organized; $6,000 capital stock; by George J. Richards, Daniel J. Leary and James Power.

Along the Middle Atlantic Seaboard

BROOKLYN, N. Y.—Koch & Wagner, architects, 26 Court street, are drawing plans for a 1-story, 41 x 115-foot factory, to cost $10,000, for the F. A. Koch Corporation, 612 Ocean avenue.

BUFFALO, N. Y.—The American Body Co., 1257 Niagara street, will build a 2-story factory building, to cost $12,000.

BUFFALO, N. Y. — The New York Car Wheel Co. is increasing the capacity of its foundry.

BUFFALO, N. Y. — The Clifton Mfg. Co. will erect an addition to its plant to increase its capacity for the manufacture of metal tubes and conduit.

BUFFALO.—The Wickwire Steel Co. has commenced to buy equipment for the steel plant it will erect in Buffalo. Contracts already let involve a 150-ton ladle crane, a 50-ton traveling crane and four smaller traveling cranes to be made by the Alliance Machine Co., Alliance, O.

HAMMONDSPORT, N. Y.—Plans are under way for a merger of the Glenn H. Curtiss Co. and the Burgess-Curtis Co., Marblehead Mass., and if they are carried out, the Marblehead plant may be enlarged by the addition of several new buildings.

NEW YORK.—The Goodman Machine & Tool Co. has been incorporated to build tools and carry on business as a consulting engineer; $10,000 capital stock; by S. Muenz, J. and L. Goodman, 562 West 148th street.

NEW YORK.—The New York Central railroad is having plans drawn by J. C. Cocker, architect, 2017 Fifth avenue, for an extension to cost $5,000, to the automobile top factory of Thos. S. Devine, 83 West End avenue.

NEW YORK. — Valentine & Kissam, architects, 25 Madison avenue, are drawing plans for a 6-story, L-shaped, 231 x 255 x 80-foot factory and power house, for L. De Jonge & Co., 446 Richmond turnpike, Tompkinsville, Staten Island. The company manufactures glazed paper. Pattison Bros., 1182 Broadway, New York, are the consulting engineers.

NEW YORK.—The New York Steam Co. contemplates the construction of a 4-story building, to be of the same height as an 11-story structure, which will be erected on Burling slip between Pearl and Water streets. Starrett & Van Vleck prepared the plans for this building which will cost about $500,000. The structure will be 107 x 116 feet and will be erected by the Thompson-Starrett Co.

BERKELEY HEIGHTS, N. J.—The Essex Novelty Co., manufacturer of caps and sparkers, has announced that it will enlarge the plant with two more additions. The work will be started in the spring.

BLOOMFIELD, N. J. — The International Fuse Co. has let a contract for the construction of a 1-story, 100 x 225-foot building.

BLOOMFIELD, N. J.—The Westinghouse Lamp Co. has started work in the construction of a 75 x 100-foot factory at Watsessing, N. J., to cost $12,000.

DENVER, N. J.—New Jersey Calcite Co. has been incorporated to develop limestone, iron and coal properties; $150,000 capital stock; by Benjamin Nicoll, Morristown; William H. Tonking, Dover, and Courtlandt Nicoll, New York.

ELIZABETH, N. J.—The Horne, Scrymiser Co., Jersey City, has let a contract for the construction of a factory in Elizabeth to comprise a 1-story, 40 x 101-foot and a 4-story, 170 x 191-foot factory building.

ELIZABETH, N. J.—The Midvale Chemical Co. has purchased a 250 x 768-foot plot of ground along the Elizabeth river. No definite plans for improvements on this property have been announced.

HIGHLAND, PARK, N. J.—The J. S. Turner White Metal Co. has been incorporated to deal in metals; $50,000 capital stock; by George S. Turner, Sarah J. Turner and John S. Turner, New Brunswick.

HOBOKEN, N. J.—The Delaware, Lackawanna & Western railroad has purchased from the Pennsylvania railroad a site in Hoboken having a frontage of 325 feet along the Hudson river. The Lackawanna will equip this yard to relieve the congestion in its freight traffic.

KEYPORT, N. J.—The plant of the American Cutlery Co. has been sold to the Aryl Chemical Co., New York. The latter concern, which was recently incorporated, will spend about $60,000 in making improvements and installing machinery. The chemical company has offices in the Pullman building, New York.

NEWARK, N. J.—Morris & Co. have let a contract for the erection of a $12,500 addition.

NEWARK, N. J. — The Newark Spring Mattress Co. will erect a steel workshop, 25 x 30 feet.

NEWARK, N. J.—The Celluloid Co. has contracted for the erection of a 1-story factory building at 25 Magazine street, to cost $8,000. The building will be 46 x 103 feet.

NEWARK, N. J. — Kraeuter & Co., 583 Eighteenth street, have let a contract for the construction of a 1-story, 37 x 80-foot, tool factory addition.

NEWARK, N. J.—The American Synthetic Dye Corporation has let a contract to the William L. Blanchard Co. for a tile block and steel addition, 67 x 150 feet, to cost $11,500.

NEWARK, N. J.—The Maas & Waldestein Co. has started work on a 1-story, 40 x 150-foot addition, which will be used as an acid concentration plant. The structure will be equipped with a number of furnaces.

NEWARK, N. J.—Gould & Eberhardt, machine tools, are having plans prepared by Lockwood, Greene & Co., 101 Park avenue, New York, for a 4-story factory, to be built at Irvington, N. J., at a cost of about $50,000.

PATERSON, N. J.—B. & Z. Van Raalte, 465 Getty avenue, have taken bids on the construction of an addition to cost $25,000.

PATERSON, N. J.—Harold J. Harder, engineer, City Hall, soon will advertise for bids for the construction of a pumping station, a disposal plant, and nine miles of sewers.

PERTH AMBOY, N. J.—The board of trade is negotiating with a machine tool builder who is considering moving his plant to Perth Amboy from another city.

PLAINFIELD, N. J.—The Ryder & Graves Electrical Co., has been incorporated to carry on business as a mechanical and electrical engineer; $25,000 capital stock; by Charles L. Ryder Jr., George F. Graves, Plainfield, and Frank Jennings, Jamesburg.

SMITH'S MILLS, N. J. — The Butler Chemical Co. has been incorporated to manufacture chemicals and dyes; $500,000 capital; by Charles T. Quick, Nyack; Herbert A. Summers, Brooklyn, and M. Girard Winters, Midland Park.

TRENTON, N. J.—Ajax-Grieb Rubber Co. has taken out a permit for the erection of a 3-story brick and steel plant, to cost $75,000.

TRENTON, N. J.—The John A. Roebling's Son's Co. will raze seven dwellings on Clark street and build an addition to its plant.

TRENTON, N. J.—Geo. S. Drew, architect, Statehouse, is drawing plans for a power house to be built at the state hospital at a cost of approximately $85,000.

TRENTON, N. J.—The Belle Mead Sweets Co. whose plant was recently damaged by fire, will build a 4-story factory on a new tract on Prospect street. The building will be 140 x 400 feet.

TRENTON, N. J.—The William F. Taubel Hosiery Co. has purchased an entire block here and will erect a plant. The company's plant at Riverside, N. J., was recently damaged by fire.

UNION, N. J.—The Holzapfel Composition

Shrapnel Talks With

ROLLING MILL JIM

What kind of tonnage are you gettin on rounds?

You know them ginks needs the stuff over there and now's the time for you to give it to 'em while the goin's good. Some day the last chunk of lead will be fired and they won't be pushin you so hard. Then you'll wish you'd had Hubbard Rolls so that you wouldn't of had to stop and make so many changes. Our Company's breaking the record for rolling rounds and we're doing it by gettin big runs on our rolls. I shouldn't be givin you guys all my dope as you'll get to usin Hubbard rolls and do as good as me and then my boss won't think I'm so damn much after all. So long,

Rolling Mill Jim.—

Hubbard Steel Foundry Co.

EAST CHICAGO, IND.

All Kinds of Iron and Steel Rolls and Steel Castings.

Co. has purchased 12 acres in Union and will erect a plant to cost $28,000.

WOODBRIDGE, N. J.—The Bayard Chemical Co. will establish a plant on Prospect avenue, having purchased an 8½-acre site.

GREENVILLE, PA.—The Greenville Water Co. will build a high-pressure pumping station and reservoir; Chester & Fleming, engineers, Pittsburgh, are preparing plans.

KINGSTON, PA.—The Jenkins-Kirby Co. is having plans prepared by McCormick & French, architects, Second National Bank building, Wilkes Barre, Pa., for a manufacturing building and a machine shop.

LOCKPORT, PA.—The James Gardner Jr. Brick works, damaged by fire early this year, will be rebuilt. Norman Young and Peter Young of Boliver, Pa., are the owners.

MEADVILLE, PA.—The Bronze Metal Co. plans to build an $80,000 extension to its plant.

MERCER, PA. — The Mercer Water Co. will build a filtration plant; Chester & Fleming, Pittsburgh, are preparing plans.

RIDGEWAY, PA. — Francis R. Weller, architect, Washington, D. C., has let contracts for the construction of a $200,000 power plant at Ridgeway, Pa., for the Ridgeway Electric Co., of which Geo. Kelber, Rochester, N. Y., is president.

PHILADELPHIA.—The plant of White & Bros., smelters and refiners at Hedley and Carbon streets, was badly damaged by fire.

PHILADELPHIA.—The Wm. Steele & Sons Co. is taking subbids on the construction of a 1-story, 70 x 100-foot factory at Germantown and Sedgley avenues, for the Air Reduction Co.

PHILADELPHIA.—The Baldwin Locomotive Works has let a contract to S. W. Marks, Cleveland, for the erection of an 8-story addition, 100 x 140 feet, at Eighteenth and Hamilton streets.

PHILADELPHIA.—The Swiss Cleaners & Dyers Co. has purchased a large tract at Fifth avenue and Broad streets for a plant. This company has been awarded a contract by the Bethlehem Steel Co. for several hundred thousand powder bags.

PITTSBURGH.—The West Penn Foundries has been incorporated; $5,000 capital stock; by G. K. Warn, S. L. Ruslander and Norman B. Lovejoy, all of Pittsburgh.

PITTSBURGH.—The Princess Motor Car Co. has been incorporated; $1,000,000 capital stock; by Isaac M. White and Frank W. Barbee, Pittsburgh, and Ola C. White, Detroit. The company will build and sell motor cars and trucks.

PITTSBURGH.—The Pittsburgh Grinding Wheel Co. has been incorporated; $5,000 capital stock; by R. T. Rossel, Carnegie building, and others.

PITTSBURGH. — The city of Pittsburgh soon will award contracts for two bridges. One structure will be built in the West End and the other, which will be 300 feet long, will connect Tuxedo and Chartiers avenue.

PITTSBURGH. — The Americus Republican club expects to build a 7-story fireproof clubhouse, to cost about $175,000. T. L. Harper is secretary of the club which owns property at Penn avenue and Fourth street.

PITTSBURGH.—The Colonial Steel Co. has purchased 60 acres, adjacent to its steel plant at Colonia, Pa., for future extensions. No definite announcement has been made regarding this site.

WASHINGTON, D. C. — The bureau of yards and docks, navy department, will receive bids until March 4 for a heating system to be installed in the foundry at the Boston navy yard.

WASHINGTON, D. C.—Bids will be received till March 1 by Jas. A. Wetmore, acting supervising architect, for an engine and generator set for the United States postoffice at Philadelphia.

Activities in the Central States

DEFIANCE, O.—The American Steel Package Co. plans to double capacity of its plant. The company now makes from 1,500 to 1,600 steel barrels a day.

YOUNGSTOWN, O.—The Youngstown & Suburban railroad has been incorporated; $10,000 capital stock; by John T. Harrington, James P. Wilson and others. The company plans to build an electric railway line from Youngstown to Leetonia.

CLARKSBURG, W. VA.—The Monongahela Valley Traction Co. will build a 4-story reinforced concrete building at Fourth street and Glen Elk Ridge.

CLARKSBURG, W. VA.—George W. Fuller, engineer, 170 Broadway, New York, is preparing plans for a 1-story brick and reinforced concrete pumping station, to be built at Clarksburg.

HUNTINGTON, W. VA.—The Empire Furniture Co. will erect a 3-story addition to its factory on Twenty-second street. Verus T. Ritter, First National Bank building, is taking bids.

KENOVA, W. VA.—The Standard Mfg. Co. has entered the market for wood working machinery, hydraulic presses and dies, heavy duty pumps, gas engines, an electric dynamo, and auxiliary equipment. J. H. Davis is general manager.

ANDERSON, IND.—The city of Anderson plans to spend $100,000 for improvements to the electric light plant. Edward Burke is superintendent of the plant.

BLOOMINGTON, IND.—Bids will be received until Feb. 24 by Dr. C. E. Harris, secretary Leonard Springs Water Co., for a power plant and equipment for pumping water.

BLOOMINGTON, IND. — Stone quarry property in the Bloomington and Bedford, Ind., district, under option to a corporation said to be the Cleveland, O., Sandstone Co., for $8,000,000, is to be acquired by the company projecting the purchase, it is stated here. The Cleveland company owns the Perry Matthews, Buskirk and Bedford quarries. Negotiations under the option, which runs until May 1, are being conducted by A. R. Dickinson, Chicago; C. C. Ingall, Bedford and Fred Mathews, Bloomington.

KOKOMO, IND.—The Superior Machine Tool Co. will build an addition to its plant, costing $50,000.

NEW ALBANY, IND.—Replacement of the steam power and pumping equipment of the United Gas & Electric Co., which owns the city's water works, with electrical pumps, etc., is reported under consideration.

PORTLAND, IND. — The Portland Body Works will build an addition 48 x 64 feet.

WABASH, IND. — The Honeywell Heating Specialties Co. has been capitalized for $30,000 to manufacture iron, steel and brass products. The directors are Mark C. Honeywell, Olive H. Honeywell and Willard L. Huff.

BELLEVILLE, ILL.—The Enterprise Foundry has been incorporated; $6,000 capital stock; by Charles Spoeneman, Louis Opp and Louis Spoeneman.

CHICAGO.—The Crown Rheostat & Supjly Co. has been incorporated; $35,000 capital stock; by C. D. Bennett, H. E. Willmore and S. E. Huenerfauth, 1404 Cullom street.

CHICAGO.—The Central Storage Warehouse Co., care of D. I. Davis & Co., engineers, 431 South Dearborn street, will build a cold storage warehouse, 14 stories, 80 x 160 feet, to cost $1,000,000.

CHICAGO.—The Anderson Electric Specialty Co. has been incorporated; $50,000 capital stock; by William L. Hall, Charles Shervey and Charles E. Burnap, 140 South Dearborn street.

CHICAGO.—The Snyder Electric Furnace Co., 53 West Jackson boulevard, has leased a site 112 x 463 feet at Sixty-sixth street and Sixtieth avenue, in the Clearing Industrial District, and will occupy a building 96 x 100 feet with an electric furnace, experimental and testing plant.

QUINCY, ILL.—The Liberty Electric Co. has been incorporated to manufacture, distribute and sell electric current for lighting, power and heating; $2,500 capital stock; by Henry E. Schmiedeskamp, Charles W. Lime, W. E. Mercer, James E. Walsh and others. The company proposes to build a plant at an early date.

ROGERS, ILL.—The Chicago & Eastern Illinois railroad has been ordered by the state railway commission to build a steel bridge over White river, near Rogers.

BATTLE CREEK, MICH.—The A-B Enameling & Foundry Co. has changed its name to the Ajax Enameling & Foundry Co., and has been incorporated as such with $35,000 capital stock.

DETROIT.—The Alter Motor Co. has increased its capital stock from $75,000 to $150,000.

DETROIT.—The General Springs & Wire Co. has increased its capital stock from $10,000 to $20,000.

JACKSON, MICH.—The city of Jackson is planning to improve the water works system at a cost of $29,000.

LANSING, MICH.—The Original Gas Engine Co. has changed its name to the Ideal Engine Co. and has increased its capital stock from $150,000 to $300,000.

MARSHALL, MICH.—Robert Campbell, superintendent of core department, and Frank Gallagher, labor foreman, both of the Campbell, Wyant & Cannon Foundry Co., of Muskegon Heights, have purchased the foundry of the Marshall Furnace Co., and will open the plant as a job foundry.

BEAVER DAM, WIS.—The Western Malleable Co., Beaver Dam, Wis., has placed in operation its South Center street foundry, one of the group of three plants which are included in the purchase of the assets of the Beaver Dam Malleable Iron Co. This company specializes in tie plates and other railroad malleable.

BELOIT, WIS. — The Berlin Machine Works is having plans prepared for a 1-story foundry, 90 x 300 feet. Porter B. Yates is president of the company.

DENMARK, WIS.—Bonds for $20,000 have

been voted for a municipal waterworks system. W. G. Kirchoffer is city engineer.

LACROSSE, WIS.—Peter Nelson 1706 State street, has been awarded the general contract for the erection of a $60,000 warehouse, shop and office building for the W. A. Roosevelt Co., 118 Pearl street, plumbers and steamfitters' supplies. The building will be steel-trussed, 70 x 100 feet, four and five stories.

MILWAUKEE.—The Magnetic Mfg. Co., Milwaukee, has been incorporated; capital stock, $15,000; incorporators, Alvin Dings, F. T. Andrae and Bernhard Kubitz.

MILWAUKEE. — The Northwestern Mfg. Co., Clinton and Madison streets, manufacturing electric motors and dynamos, has increased its capital stock from $50,000 to $100,000.

MILWAUKEE.—The Sivyer Steel Casting Co., which is making extensions to its foundry at Thirty-seventh avenue and Mitchell street, has increased its capital stock from $100,000 to $250,000.

MILWAUKEE.—The iron works business conducted for many years at 193 Broadway, Milwaukee, by W. Toepfer & Sons, has been incorporated under the name of the W. Toepfer & Sons Co., with a capital stock of $50,000. Irwin G. Toepfer is general manager.

MILWAUKEE.—The Heil Co., Twenty-sixth and Montana avenues, structural steel, boilers, tanks, etc., has increased its capital stock from $20,000 to $50,000. The increase was made to accommodate the increased business. Julius P. Heil is general manager.

MILWAUKEE. — Max Wishnefsky, scrap metal dealer, 427 Fourth street, is about to erect a new warehouse and yards at Burleigh and Thirtieth streets, with an investment of $20,000 in building and site. Plans are now being prepared for a brick and concrete building, 70 x 90 feet.

MILWAUKEE.—One of the coal bridges at the Commerce street dock of the Milwaukee-Western Fuel Co., Empire building, Milwaukee, collapsed. The dock was 300 feet long and is believed to be a total loss. Provision is being made for immediate reconstruction. E. A. Uhrig is president.

MILWAUKEE.—Stanley F. Kadow, architect, 988 Kinnickinnic avenue, is preparing plans for a foundry costing $5,000, to be erected on Clinton street, near the Kinnickinnic river. The name of the owner is being withheld until plans mature. The building will have 12-inch cement block walls, fireproof, and dimensions 50 x 68 feet. It is expected that further details will be available about March 1.

MILWAUKEE. — Among sub-contracts awarded on the $1,500,000 Plankinton arcade building, Grand avenue, West Water to Second streets, by John H. Parker Co., New York, general contractor, are the following: Structural steel, 143 tons, Milwaukee Bridge Co., Milwaukee; ornamental iron, Flour City Ornamental Iron Works, Minneapolis; miscellaneous iron, Variety Mfg. Co., Chicago; elevators, Otis Elevator Co.

MILWAUKEE. — The Federal Engineering Co., Stephenson building, has been awarded the structural contract on the new Main exchange building of the Wisconsin Telephone Co., to be erected at 420-426 Broadway. The building will be steel and brick, eight stories, 120 x 120 feet, with provision for eight additional stories. Six passenger elevators will be required. Plans are being completed by A. C. Eschweuler, architect, Goldsmith building.

OSHKOSH, WIS.—The Morgan Lumber Co., 414 Merritt street, Oshkosh, has awarded contracts for the erection of a large mill addition, 76 x 220 feet, three stories, to be connected with other buildings by a steel bridge. J. M. Baker is manager.

VESPER, WIS.—The Vesper Iron Works has been incorporated; $10,000 capital stock; by C. R. Goldsworth, Louis Greb, A. H. Wabers.

WAUPUN, WIS.—The Paramount Knitting Co., Chicago, which operates the knitting mill in Waupun, is preparing to erect a new mill. Plans are being prepared by Lockwood, Greene & Co., Chicago, for a 3-story building, 50 x 120 feet, with new machinery and equipment. Work will begin March 1.

CARTERVILLE (JASPER COUNTY), MO. —The Carterville Sheet Metal Co. has been incorporated to manufacture sheet metal and mining machinery; $12,000 capital stock; by F. C. Wallover, L. R. Reynolds and John Boyd.

OREGON (HOLT COUNTY), MO.—The St. Joseph Transmission Co. has been incorporated; $50,000 capital stock; by D. W. Martin, W. H. Richards and W. S. Gifford.

ST. LOUIS, MO.—T. P. Barnett & Co., architect, Central National Bank building, is preparing plans for a 10-story hotel for the S. S. Kresge Co., 510 Washington avenue.

ST. LOUIS, MO.—The Booth Fisheries Co., 122 West Monroe street, Chicago, will build a boiler house to cost $10,000 at Main and Ashley streets. C. B. McCormick & Sons, Columbia building, have the general contract.

ST. LOUIS, MO.—A cold storage warehouse, 12 stories, to cost $1,000,000 is being planned for the Booth Cold Storage Co., 121 West Kenzie street, Chicago. D. I. Davis & Co., 431 South Dearborn street, Chicago, are the engineers in charge.

ST. LOUIS, MO. — The Great Western Smelting & Refining Co. has let a contract to the J. Hill Construction Co. for a 1-story foundry and a 3-story warehouse at 3108 North Broadway. The estimated cost of construction is about $50,000.

DES MOINES, IA.—The city council of Des Moines has ordered plans prepared for a bridge at North street, estimated at $200,000.

FORT MADISON, IA. — The Acme Chandelier & Mfg. Co. has been incorporated; $50,000 capital stock; by W. S. Scherfe and B. F. Schreves.

DULUTH, MINN. — The Duluth Gas & Welding Co. is to enlarge its plant at a cost of $7,000.

ST. PAUL. — The Omaha railroad, J. T. Clark, vice president, St. Paul, is having plans prepared by Charles S. Frost, architect, 105 South LaSalle street, for an office building, eight stories, 99 x 126 feet, to cost $500,000.

ST. PAUL.—The Packett Motor Car Mfg. Co. has been incorporated to manufacture a light delivery truck and will build a factory; $150,000 capital stock; by Henry Orme, president of Henry Orme Sons, is president of the company.

In the South and Around the Gulf

CHATTANOOGA, TENN. — Construction work on the tannic acid plant of the Marion Extract Co. has begun. This plant, which will cost $150,000, will be in operation by July 1. The contract for the two steel buildings has been let to the Walsh & Weidner Boiler Works. The machinery will be electrically driven. G. H. Wilson, Marion, is supervising the construction.

MEMPHIS, TENN.—S. M. Neely, of the Consolidated Zinc & Rock Co., reorganized with $500,000 capital, states that the company will immediately construct and equip a zinc mill at the mines, Black Rock, Ark., to be followed by other mills later on. The headquarters of the company are in Memphis.

CRAB ORCHARD, KY.—William Brown, Pineville, Ky., is expected to purchase the electric lighting franchise which the town council will sell on March 7.

FLEMINGSBURG, KY.—Owners of the local electric lighting company have engaged D. Bankel, electrical engineer, Cincinnati, to examine the plant with a view to changing it from direct to alternating current.

GLASGOW, KY. — The Glasgow Electric Light & Ice Co., which will make improvements in its plant, has increased its capital stock from $50,000 to $75,000.

LOUISVILLE, KY.—Contracts for erection and equipment of the new reinforced concrete elevator of the Southern Elevator Co., projected by the W. A. Thomson & Co. interests, grain dealers in the American bank building, Louisville, will be awarded shortly.

MIDDLESBORO, KY.—Equipment and material in the Watts steel plant in Middlesboro constructed at a cost of $6,000,000, has been sold by the Virginia Iron, Coal & Coke Co. to the Boston Iron Works, Baltimore, and will be scrapped and shipped east.

PADUCAH, KY.—The Paducah Ice Co. has set aside a fund of $60,000 for enlarging its plant in Paducah.

NEWPORT, ARK.—Plans are being prepared by the Arkansas Light & Power Co., Arkadelphia, for a power plant in Newport.

NEW ORLEANS, LA.—Bids will be received until March 2 by F. S. Shields, secretary of the sewerage and water board, 508 City Hall annex, for an addition to the pumping station. George G. Earl is general superintendent.

HOUSTON, TEX.—The Womack Construction Co. has been incorporated; $30,000 capital stock; by Charles M. Womack, John H. Kirby, Ernest Jeyres and Fred C. Eisman.

SAN ANTONIO, TEX.—The International & Great Northern railroad, O. H. Chittendon, chief engineer, Houston, has plans prepared for a reinforced concrete and steel division shops at San Antonio.

TEMPLE, TEX.—The Atchison, Topeka & Santa Fe railroad is planning to spend $250,000 on improvements to its pumping stations over the whole system. C. F. W. Felt, Chicago, Ill., is chief engineer.

TYLER, TEX.—The city of Tyler has voted for $250,000 in bonds for a waterworks system. Henry E. Elrod, Dallas, Tex., is consulting engineer.

OKLAHOMA CITY, OLKA.—The L. F. Lee Construction Co. has been incorporated; $10,000 capital stock; by R. L. Lee, G. M. Buxton and M. E. Lee, all of Oklahoma City.

Western and Intermountain Territory

CEDAR, KAS.—The electric light plant recently damaged by fire will be rebuilt.

LEAVENWORTH, KAS. — The city of Leavenworth is preparing plans for a municipal waterworks plant.

VALPARISO, NEB.—The Valpariso Electric Co. will rebuild its plant, recently damaged by fire.

ANACONDA, MONT.—The Anaconda Co. has announced that plans for a concentrator to handle the zinc ores of Washoe smelter are practically complete and work is to start at once. This plant will have a minimum capacity of 2,000 tons per day, provisions being made for increasing this output. S. S. Rogers has been appointed superintendent of the new zinc concentrator at the Washoe plant.

GREAT FALLS, MONT. — The Montana Power Co. will start construction of its hydroelectric plant on Wolfe creek in the spring. Surveys will be started shortly. The plans include the construction of the Hebgen storage reservoir on Madison river, supplemented by storage reservoirs at Canyon Ferry and Hauser lake, and the Holter reservoir. The total length of the dam will be 1,400 feet and included in its construction will be 1,500 tons of steel. The plans include seven main hydraulic units, each wheel to develop 8,800 horsepower under full gate opening and direct connected to a 5,000-kilowatt 3-phase alternating current generator. Work on the Holter plant was started in 1908 by the United Missouri River Power Co. and the Stone & Webster Engineering Corporation. F. M. Kerr, Butte, Mont., is general manager of the Montana Power Co. It is estimated that the construction will cost $3,000,000, requiring about two and one half years to build. This company is furnishing the power for operating the Chicago, Milwaukee and St. Paul trains through the mountains of Montana.

PHOENIX, ARIZ.—The City of Phoenix has retained the Burns & McConnell Co., consulting engineer, Interstate building, Kansas City, Mo., to prepare plans and estimates for a municipal electric light and gas plant in Phoenix, at an estimated cost of $750,000. George W. Barrows is chairman of the committee in charge.

Pacific Coast and Western Canada

RICHMOND, CAL.—Bids will be taken in the spring for a waterworks system to cost $2,500,000.

SEATTLE, WASH.—The board of public works has awarded a contract for lead cable to the John A. Roebling Sons Co.

SEATTLE, WASH.—The Distributor Plate Casting Machine Co. has been incorporated; $200,000 capital stock; by Martin Leinweber and Hein Te Roller.

SEATTLE, WASH.—Bids will be received until March 3 by the board of public works, C. B. Bagley, secretary, for a steel bascule bridge and operating machinery at Eastlake avenue.

SEATTLE, WASH.—City Engineer A. G. Dimock and the superintendent of waterworks, L. B. Youngs, will recommend the construction of 16 miles of permanent steel pipe between Swan Lake and the city reservoirs.

WALLA WALLA, WASH. — The Pacific Power & Light Co. plans extensive additions to its power plants in the Walla Walla district.

PORTLAND, ORE.—Bids will soon be received by city purchasing agent Wood for 8,000 feet of electric cable.

PORTLAND, ORE.—The General Electric Co. through its Portland branch has the contract for furnishing the Hawley Pulp & Paper Co., Oregon City, a 1,000-kilowatt electric generator, motors and switchboards.

PORTLAND, ORE.—The local branch of the Platt Iron Works has secured a contract from the Hawley Pulp & Paper Co., Oregon City, for the following equipment: Three 750-horsepower turbine water wheels, to be direct connected to grinders in the pulp mill and one 1,100-horsepower, twin turbine wheel for direct connection to a 1,000-kilowatt generator. The units will be complete, including draft tubes, intake pipes and governors. Other equipment comprised in this order are three vertical 1,460-horsepower water-tube boilers, arranged for high pressure and superheat and equipped for burning oil and auxiliary pumping equipment.

EDMONTON, ALTA.—The plant of the Emory Mfg. Co. was seriously damaged by fire with a loss of $100,000.

SASKATOON, SASK.—The Excelsior Machine Co. has been incorporated to manufacture machinery, tools, implements, etc.; $10,000 capital stock.

KETCHIKAN, ALASKA.—Bids will be received until March 10 by U. S. light house inspector for the erection of a skeleton steel tower and an accumulator house at Dewey Rocks near Ketchikan.

New Business in Eastern Canada

GALT, ONT.—The A. B. Jardine Foundry was damaged by fire to the extent of about $60,000. Considerable machinery used for the manufacture of shells was seriously damaged.

PEMBROKE, ONT.—The Pembroke Iron Works has been incorporated to do business as a general founder and conduct a machine shop; $100,000 capital stock; by James F. Munro, Peter White and Thomas Pink.

TECUMSEH, ONT.—The Eau Claire Water Works Co., Ltd., recently incorporated, will build a waterworks plant at Tecumseh, Ont.,

TORONTO, ONT.—John B. Smith & Sons, Toronto, Ont., is in the market for a 25 to 30-ton saddle tank locomotive.

TORONTO, ONT. — The Hamilton Gear Machine Co., Concord avenue and Van Horne street, will build an addition to its plant to cost $4,500.

TORONTO, ONT. — The chairman of the Toronto Electric commission, 15 Wilton avenue, Toronto, is calling for bids for the supply of pole type transformers.

TORONTO, ONT.—Witchall & Son, 156 St. Helens avenue, Toronto, is receiving subtenders in connection with the power station which is to be erected near Orillia, Ont.

TORONTO, ONT.—The Wilson Munitions, Ltd., has been incorporated to manufacture war munitions of all kinds, machinery, tools, iron, steel, etc.; $50,000 capital stock; by David I. Grant, care Johnston, McKay, Dods & Grant, room 623 Traders' Bank building; Robert McKay, 263 Russell Hill road, Melville MacDonald, 38 Carlton street, all of Toronto.

TORONTO, ONT.—The International Copper Co. has been incorporated; $150,000 capital stock; by George J. Valin, Arthur J. Manley and Alexander V. McPhail, Sudbury, Ont.

TORONTO, ONT.—The Machine & Stamping Co. has been incorporated to build all kinds of machines and machine tools, $100,000 capital stock; by Kenneth F. Mackenzie, W. H. Cook and Arthur L. Reid, Toronto.

TORONTO, ONT, — The board of control will appropriate funds for the construction of the Ashdale avenue subway, estimated to cost $10,000. R. C. Harris is commissioner of works for Toronto.

TORONTO, ONT.—The Advance Engineering Co. has been incorporated to carry on business as consulting engineer, chemist and contractor; $20,000 capital stock; by Howard S. Ross, Eugene O. Angers and Henry M. Gardner, of Montreal.

TORONTO, ONT. — The Ontario Machine Co. has been incorporated to manufacture farm, dairy and other machinery; $100,000 capital stock; by William G. Smart, James Chisholm, Thomas B. McQuesten and others all of Hamilton, Ont.

TORONTO, ONT. — The Canadian Rock Drill Co. has been incorporated to manufacture drill machinery, machines, iron, copper, brass, etc.; $50,000 capital stock; by Walter J. Boland, 1391 Bloor street west, John F. Boland, Ella L. Kelly and others, all of Toronto.

TORONTO, ONT.—New Toronto is contemplating making extensions to its waterworks plant in order to supply Goodyear Tire & Rubber Co., and the Grand Trunk railroad with water. The present capacity of the plant is 750,000 gallons per day, which will be increased to 2,000,000 gallons per day. George D. Scott is the clerk.

WELLESLEY, ONT.—The town of Wellesley will call for tenders in about two months for the erection of an electric distribution plant to cost $7,500. The town clerk is P. F. Schummer, St. Clements P. O., Ont.

WINDSOR, ONT. — The Chalmers Motor Co., of Canada, has been incorporated to build automobiles, automobile parts, motors, etc.; $1,000,000 capital stock; by Hugh Chalmers, Clarence A. Pfeffer and Starling H. Humphrey, all of Detroit, Mich.; and Alexander R. Bartlett of Windsor.

WOODBRIDGE, ONT. — Edwards & Edwards, 762 Dupont street, Toronto, Ont., has leased a building at Bridgeburg, Ont., and will equip it for the manufacture of leather goods of all kinds.

MONTREAL, QUE. — The Williams Mfg.

Co. will build a foundry at its plant on St. James Street, Montreal.

MONTREAL, QUE.—The Steel Co. of Canada will build an addition to its plant at Montreal, to cost $24,000.

MONTREAL, QUE.—The Gill Motor Co. has been incorporated to build motors, automobiles, engines, machinery, etc.; $100,000 capital stock; by T. M. Gill, G. M. Smyth, J. B. Poisson and others, all of Montreal.

MONTREAL, QUE.—Gratton Fils has been incorporated to build railways, wharves, docks, etc.; $150,000 capital stock by Louis Gosselin, Charles P. Debuc, James Renwick and others all of Montreal.

MONTREAL, QUE.—The Lyman Tube & Supply Co. has been incorporated; $180,000 capital stock; by Charles P. Lyman, Westmount, Que., Lawrence MacFarlane and W. B. Scott, Montreal.

MONTREAL, QUE.—Plans will be prepared for the construction of a power plant and pumping station to be built at the end of the aqueduct canal. The capacity of the plant will be 10,000 horsepower and will cost $1,500,000. F. E. Field, Point St. Charles, Que., is resident engineer.

MONTREAL, QUE.—DeSales Mfg. Co., Ltd., has been incorporated to build and operate steam and electric power plants, to generate heat, light and power; $100,000 capital stock; by Jacob Y. Fortier, Charles Duhamel, Abraham W. Muhlstock, all of Montreal.

MONTREAL, QUE.—Plans are being prepared for the construction of 11 concrete bridges to be built over the city aqueduct. The bridges will all be of reinforced concrete, and some will be constructed in the spring. The estimated cost of the 11 bridges is $560,000. F. E. Field, Atwater avenue, Point St. Charles, Que., is the engineer.

MONTREAL, QUE.—The International Time Recorder Co., of Binghamton, N. Y., has purchased the W. A. Wood Co. plant, at 40 St. George street, Montreal, Que. The company will also establish a factory at Toronto, Ont., about April 1. J. E. Rogers is president of the Canadian company and F. E. Millen is general manager. The company will manufacture time clocks, recorders of all kinds, etc.

QUEBEC, QUE.—The Chandler Machinery Co. has been incorporated to manufacture machinery, tools, etc.; $49,000 capital stock; by A. Langpois and others of Quebec.

QUEBEC, QUE.—The Steel Foundry of Quebec, has been incorporated to manufacture iron, steel, machinery, etc.; $49,000 capital stock; by E. Massicotte, E. Trudel, J. A. Larue, all of Quebec.

SAULT AU RECOLLET, QUE.—The town council is contemplating the erection of a filtration plant, water supply system, and sewage system to cost about $150,000.

SOREL, QUE.—The Munitions & Machinery, Ltd., has been incorporated to manufacture shells, bombs, machinery, tools, etc., $100,000 capital stock; by Andrew P. O'Connor, of Huntington, Que.; William B. McLean of Lachine, Que.; Edward A. D. Morgan, of Montreal, and others.

SYDNEY, N. S.—It is announced that the International Nickel Corporation will establish its Canadian refinery near the Dominion Steel Co.'s plant at Sydney, N. S.

New Trade Publications

PNEUMATIC COMPRESSORS.—The Chicago Pneumatic Tool Co., Chicago, is sending to the trade a 16-page booklet devoted to pneumatic compressors, fuel oil and gas engines. The equipment is briefly described and the pages of this pamphlet illustrate the extensive and varied line of this equipment manufactured by this company.

OPTICAL INSTRUMENTS. — A 36-page catalog has recently been issued by Bausch & Lomb Optical Co., Rochester, N. Y., describing microscopes and other optical instruments, including photomicrographic cameras, specially designed for the inspection and testing of iron, steel and other metals. Details regarding the various instruments are presented, together with illustrations and list prices.

STAMPINGS. — The Bettcher Mfg. Co., Cleveland, O., has issued a 28-page catalog describing and illustrating various types of standard stampings and plumbers' supplies, including standard wrought washers and special washers of steel, copper and brass, pipe hangers, I-beam clamps, lag screws, grommets, taper keys, etc. Sizes and list prices are presented, together with illustrations of the various articles.

SHOVELING MACHINE. — The Lake Shore Engine Works, Marquette, Mich., has issued a large folder describing and illustrating its shoveling machine. The illustrations show this machine in various operating positions, a feature being the reproduction of a moving picture film showing the succession of operations. This machine has been in service for some months in various iron mines of the Lake Superior district.

BUCKETS.—The Hayward Co., New York, has issued an attractive pamphlet showing its different types of buckets, adapted to a wide variety of service. The Hayward Co. manufactures orange peel, clam shell, drag scraper and electric motor clam shell buckets; skid excavators, dredging machinery, traveling derricks, counterweight drums and coal handling machinery. The pamphlet is profusely illustrated.

TRIPLEX PUMPS. — The Scranton Pump Co., Scranton, Pa., has issued a bulletin describing its vertical, divided water-end type pumps operating under a 350-foot head or 150 pounds pressure per square inch. This type of machine is built either vertically or horizontally and is said to be suited to all purposes for which pumps are used, including mine service, boiler feeding, brine circulation, tank supply and elevator service. It is claimed that the machines are built to permit the easy removal of the valve chamber from the cylinder when repairs are necessary.

SPRINGS.—Raymond Mfg. Co., Corry, Pa., has issued a 28-page catalog describing the complete line of springs which it manutactures for various purposes, including plain coil extension springs, coil compression springs, torsion springs, conical springs, agricultural implement springs, gas engine and automobile springs, bicycle saddle springs, wagon-pole springs, brake springs, door springs, bolster springs, etc. The catalog also contains suggestions for the engineer and draftsman on the design of springs and formulas covering the supporting power and deflection of springs of various types.

BORING MACHINE.—A handsome 48-page catalog published by the Barrett Machine Tool Co., Meadville, Pa., describes its horizontal cylinder boring machines. Among the various types of machines described and illustrated are various models designed for boring gas engine cylinders, motor and dynamo field frames and cylinders of the Corliss type, also for the simultaneous boring of high and low pressure steam cylinders. Other machines described in the catalog are designed to bore and face both ends of a cylinder at the same time. The catalog contains descriptions of three-way facing machines, duplex cylinder portable boring machines, light portable boring and facing machines and various accessory equipment.

TRAMRAIL AND TROLLEY SYSTEMS. —Catalog D recently issued by the Brown Hoisting Machinery Co., Cleveland, describes and illustrates the extensive line of tramrail systems, trolleys and electric hoists manufactured by this concern. Particular attention is devoted to the Brown hoist monorail mantrolley used for transporting various kinds of materials between cars, boats and storage yards or buildings. It travels on the lower flange of an I-beam track and is operated by a man who rides in the trolley cab. It may be equipped either with a grab bucket or with from one to four hooks. The catalog also contains a large number of illustrations of various styles and sizes of Brownhoist trolley equipment.

HYDRAULIC PRESSES.—The Hydraulic Press Mfg. Co., Mt. Gilead, O., has issued two folders devoted to its hydraulic presses for heading brass cartridge cases and for cupping and drawing. The former press has a maximum pressure capacity of 1,000 tons. This press, it is stated, will make 3½ pressings per minute with the pump furnishing 19¼ gallons of water per minute at a pressure of 3,250 pounds per square inch. The pamphlet describing the press for cupping and drawing, discusses the results obtained by the Prest-O-Lite Co., Indianapolis, in manufacturing dissolved acetylene cylinders. These cylinders are cupped and drawn on an 800-ton drawing press. The cups are cold drawn from a steel disc, 42 inches in diameter and about ¼-inch thick.

ROTARY VACUUM PUMPS. — An eight-page pamphlet, issued by the Connersville Blower Co., Connersville, Ind., is devoted to its line of valveless rotary vacuum pumps designed for vacuum heating systems, vacuum filtration, vacuum drying and cleaning, suction roll work, evaporating pans, jet and surface condensers, ice-making, creosoting plants, priming centrifugal pumps, etc. These machines are built in various sizes with capacities of 50 to 375 gallons per minute. One noteworthy feature of this type of pump is that air or gases and liquids can be handled simultaneously. The pump has no valves, no valve ports or clearance spaces and no internal parts requiring lubrication. The impellers, or rotors, are the only moving parts. They do not touch each other or the surrounding case and, therefore, to be efficient, they should be sealed with water.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery July 1.)

Bessemer, valley	$20.50 to 21.00
Bessemer, Pittsburgh	21.45 to 21.95
Basic, Pittsburgh	18.70 to 18.95
Basic, eastern Pa.	19.50 to 19.75
Basic, Buffalo	20.00
Malleable, Pittsburgh	19.45 to 19.95
Malleable foundry, Chicago	19.00
Malleable foundry, Philadelphia	20.50 to 20.75
Malleable foundry, Buffalo	18.00 to 19.00
No. 1X foundry, Philadelphia	20.50 to 20.75
No. 2 foundry, Pittsburgh	19.45 to 19.95
No. 2 foundry, Cleveland	19.30
No. 2 foundry, Ironton	18.00
No. 2 foundry, Chicago	18.50
No. 2X foundry, Philadelphia	20.00 to 20.50
No. 2X foundry, N. J. tidewater	20.00 to 20.50
No. 2X foundry, Buffalo	18.00 to 19.00
No. 2 plain, Philadelphia	19.50 to 20.00
No. 2 plain, N. J. tidewater	19.50 to 20.00
No. 2 plain, Buffalo	17.50 to 18.50
No. 2 southern, Birmingham	14.50 to 15.00
No. 2 southern, Cincinnati	17.40 to 17.90
No. 2 southern, Chicago	19.00 to 19.50
No. 2 southern, Phila. delivery	20.00 to 20.50
No. 2 southern, Cleveland	18.50 to 19.00
No. 2 southern, New York docks	18.50 to 19.00
No. 2 southern, Boston docks	18.25 to 18.75
No. 2 south. interior, New Eng.	18.50 to 19.50
No. 2 southern, St. Louis	18.40 to 18.90
Virginia No. 2X furnace	18.00
Virginia 2X, Philadelphia	20.75
Virginia 2X, Jersey City	21.00
Virginia 2X, Boston points	21.25
Gray forge, eastern Pa.	18.50 to 19.00
Gray forge, Pittsburgh	18.95 to 19.45
Gray forge, Birmingham	14.00
Silveries, 8 per cent, Jackson, O.	25.00
Silveries, 8 per cent, Chicago	27.50 to 28.00
Low phos. Standard, Phila.	32.00
Low phos. Lebanon, Pa.	29.00 to 31.00
Low phos. Pittsburgh	30.00 to 31.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	19.75 to 22.25
Charcoal, Buffalo	19.00 to 20.00
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.

(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	$4.45
Mesabi Bessemer, 55 per cent, ton	4.20
Old range non-Bes., 51½ per cent, ton	3.70
Mesabi non-Bess., 51½ per cent, ton	3.55

Eastern Ores.

(Per unit delivered eastern Pennsylvania.)

Pt. Henry fur., 60 per cent, unit.	8.6c to 8.9 c
Local N. Y. and N. J. ores, unit.	8.5c to 8.75c
Port Henry lump, at mines, ton	$4.00

Foreign Ores.

(Per unit Philadelphia.)

(Prices nominal.)

Foreign Bess., 50 to 65 per cent	8 to 8½
For'n non-Bess., 50 to 65 per cent	8 to 8½

COKE

(At the ovens.)

Connellsville furnace	$3.25 to 3.50
Connellsville fur., contract	2.50 to 3.00
Connellsville foundry	3.75 to 4.00
Connellsville fdy. contract	3.75 to 4.00
Wise county furnace, contract	2.85 to 3.10
Wise county foundry, contract	3.25 to 3.50
Pocahontas foundry, contract	3.00 to 3.25
Pocahontas furnace, contract	2.75 to 3.00
New River, foundry contract	3.50 to 3.75
New River, furnace contract	3.00 to 3.25

FERRO ALLOYS AND STEEL MAKING METALS

Ferro mang., delivered (prompt)	$200 to 250
Ferro mang., Balti., (future)	150
Spiegeleisen 20 per cent, furnace	40.00
Ferro-silicon, 50 per cent, Phila.	83.00 to 85.00
Ferro silicon, 50 per cent, Pbgh.	83.00 to 85.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $27.00; 10 to 11 per cent, $28.00; 11 to 12 per cent, $29.00; 12 to 13 per cent, $30.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, 4 to 6 per cent carbon, 25 cents per pound; 2 per cent carbon, nominal.

Ferro-vanadium, nominal, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, nominal.

Ferro-tungsten, nominal.

Cobalt metal, nominal, Pittsburgh.

Aluminum, nominal, Pittsburgh.

Ferro-molybdenum, Pittsburgh, nominal.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive for insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$42.00 to 45.00
Bessemer billets, Phila.	36.00 to 38.00
Forging billets, Phila.	55.00 to 60.00
Forging billets, Pbgh (nominal).	55.00
Forging billets, Chgo.	50.00 to 55.00
Wire rods, Pittsburgh (nom.)	50.00
Bessemer billets, Youngstown	34.00 to 35.00
Open hearth billets, Youngstown	35.00 to 40.00
Bessemer billets, Pittsburgh	34.00 to 35.00
Open hearth billets, Pittsburgh	35.00 to 40.00
Bess. sheet bars, Youngstown	34.00 to 35.00
Op. h'th sheet bars, Youngstown	35.00 to 40.00
Bess. sheet bars, Pittsburgh	34.00 to 35.00
Open h'th sh. bars, Pbgh.	35.00 to 40.00
Muck bar, Pittsburgh (nominal)	36.00 to 38.00

SKELP

Grooved steel skelp	1.90c to 1.95c
Sheared steel skelp	1.95c to 2.00c

RAILS AND TRACK MATERIAL

Stand. Bess. rails, Pbgh & Chg.	1.25c
Stand. op-h'th rails, Pbgh. & Chg.	1.34c
Light rails, 8 to 10 lbs., Pbgh.	1.85c
Light rails, 8 lb., Chgo.	1.67c
Light rails, 12 to 14 lbs., Pbgh.	1.80c
Light rails, 12 lbs., Chgo.	1.62c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—

Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18

Buffalo to:—

Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60

Virginia furnaces to:—

Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88

Birmingham, Alt., to:—

Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75

Chicago to:—

Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58

Ironton and Jackson, O., to:—

Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails 16 to 20 lbs., Pbgh.	1.75c
Light rails 16 to 20 lbs., Chgo.	1.57c
Light rails 25 to 45 lbs., Pbgh.	1.70c
Light rails 25 to 45 lbs., Chgo.	1.52c
Relaying rails, standard, Pbgh. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect., Pbgh. base.	1.50c to 1.75c
Angle bars, st. sections, Chicago	1.50c to 1.75c
Spikes, railroad, Pbgh.	2.25c
Spikes, railroad, Chgo.	2.35c to 2.45c
Track bolts, Pbgh.	2.50c
Track bolts, Chgo.	2.60c to 2.80c
Tie plates, Chgo.	40.00 to 42.00

SHAPES, PLATES AND BARS

Structural shapes, Pbgh. (con.)	2.00c to 2.25c
Structural shapes, Chgo.	2.19c to 2.49c
Structural shapes, Philadelphia	2.159c to 2.409c
Structural shapes, New York	2.169c to 2.419c
Struc. shapes, San Francisco	2.00c to 2.05 c
Tank plates, Chgo.	2.29c to 2.54c
Tank plates, Pbgh. (con.)	2.10c to 2.50c
Tank plates, Philadelphia	2.259c to 2.659c
Tank plates, New York	2.269c to 2.669c
Bars, soft steel, Pbgh.	2.00c
Bars, soft steel, Chgo.	2.19c to 2.49c
Bars, soft steel, Pbgh. (con.)	2.00c to 2.25c
Bars, soft steel, New York	2.169c to 2.269c
Hoops, carloads, Pbgh.	2.20c
Bands, Pittsburgh	2.00c
Shafting, Pbgh., contr. carloads	40 off
Bar iron, Chgo.	1.90c to 2.00 c
Bar iron, Philadelphia	2.409c
Bar iron, New York	2.419c
Bar iron, Cleveland	2.25 c
Bar iron, Pittsburgh	2.20c to 2.30c
Hard steel bars, Chgo.	2.00c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	2.60c to 2.75 c
No. 28, black, Chgo.	2.79c to 2.94c
No. 28, tin mill, black, Pbgh.	2.50 c
No. 28, galvanized, Pbgh.	4.75c to 5.25 c
No. 28, galvanized, Chgo.	5.19 c
No. 10, blue anl'd, Pbgh.	2.60c to 2.80c
No. 10, blue anl'd, Phila.	2.759c to 3.159c
No. 10, blue anl'd., Chgo.	2.94 c
Tin plate, 100 lb., coke base.	$3.75 to 4.00

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickl'd, cold roll. and re-anld.	30 cents
Hot roll'd pickled and anl., tin mill.	25 cents
Full pickled, cold rolled and re-anld.	50 cents
Auto sheets	75 cents
Blue stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxiding	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free fr. mill scale	55 cents
Special open hearth deep stpg. steel, free from mill scale	80 cents
Extra deep special auto body stock.	1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt-weld.	Galv. Butt-weld.
Steel, ⅜ to 3 inches	66	60½
Iron, ⅜ to 1½ inches	66	48
	Lap-weld.	
Steel, 2½ to 6 inches	77	62½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	64
Iron, 3½ to 4½ inches, l. c. l.	53

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$2.20
Plain, wire, jobbers, Pittsburgh	2.15
Galvanized wire, jobbers', Pbgh.	2.85
Polished staples, Pbgh.	2.45
Galvanized staples, Pbgh.	3.15
Barb wire, painted, jobbers', Pbgh.	2.45
Barb wire, galv., jobbers', Pbgh.	3.13

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 70, cut threads 65 and 10; larger or longer, 60 and 5.

Machine bolts with hot pressed nuts, ⅜ x 4 inches, smaller or shorter, rolled 70 and 5; cut, 70; larger or longer, 60 and 10.

Cold pressed, semi-finished hex. nuts, 75 and 10.

Gimlet and cone point lag bolts, 70 and 10. Hot pressed square, blank or tapped nuts, $4.00 off list; hot pressed hexagon blank or tapped, $4.20.

Cold pressed square, blank or tapped, $3.75 off; hexagon, blank or tapped, all sizes, $4.75.

RIVETS

Structural rivets, Pbgh	2.80c
Structural rivets, Chgo. delivery	2.90c
Boiler rivets, Pbgh	2.91c
Boiler rivets, Chgo. delivery	3.00c

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	2.00c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil	4.50c

COLD ROLLED STRIP STEEL

Base price $4.25 per 100 pounds, hard, coils 1½ inches and wider and by .100 inches and heavier.

Extras.

.10 to .19 carbon. 1½ inches and wider.

	Coils. Hard.	Soft.
0.100 and heavier	Base	$0.25
0.050 to 0.099	$0.05	0.30
0.035 to 0.049	0.20	0.45
0.031 to 0.034	0.35	0.75
0.025 to 0.030	0.45	0.85
0.020 to 0.024	0.55	0.95
0.017 to 0.019	1.35	1.35
0.015 to 0.016	1.75	1.75
0.013 to 0.014	2.45	2.45
9.012	2.80	2.80
0.011	3.15	3.15
0.010	3.50	3.50

Lengths 24 Inches and Over.

	Hard.	Soft.
0.100 and heavier	$0.10	$0.35
0.050 to 0.099	0.20	0.45
0.035 to 0.049	0.35	0.60
0.031 to 0.034	0.60	1.00
0.025 to 0.030	0.85	1.25
0.020 to 0.024	1.05	1.45
0.017 to 0.019	2.45	2.45
0.015 to 0.016	2.85	2.85
0.013 to 0.014	3.70	3.70
0.012	4.30	4.30
0.011	4.65	4.65
0.010	5.00	5.00

Extras as per card of Jan. 1, 1916.

CAST IRON WATER PIPE

Four-inch, Chicago	$32.50 to 33.00
Six-inch and larger, Chicago	29.50 to 30.00
Six-inch Class B, New York	29.50
Four-inch, Class B, New York	32.50
Four to six-inch, Birmingham	27.00 to 28.00
Six-inch and larger, Birmingham	25.00

Light weight water and gas pipe, $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	2.60c
Steel squares, 2-in. & ov., Cleve.	2.95c
Steel rounds, 2 in. and over	3.20c
Steel bars, under 2 in., Cleveland	2.70c
Steel bars, Philadelphia	2.60c
Steel bars, New York	2.70c
Steel bars, St. Louis	2.65c
Steel bars, Cincinnati	2.70c
Steel bars, St. Paul	2.70c
Steel bars, over 2-inch, Buffalo	3.15c
Steel bars, Buffalo	2.70c
Iron bars, Chicago	2.30c
Iron bars, Cleveland	2.65c
Iron bars, St. Louis	2.50c
Iron bars, Cincinnati	2.65c
Iron bars, Philadelphia	2.60c
Iron bars, New York	2.70c
Plates, Chgo.	2.80c
Shapes, Chgo.	2.60c
Shapes, St. Louis	2.65c
Shapes, St. Paul	2.70c
Shapes, Cleveland	2.70c
Shapes and plates, Buffalo	2.45c
Shapes and plates, Cincinnati	2.70c
Plates, St. Louis	2.85c
Plates, St. Paul	2.90c
Plates, New York	3.25c
Shapes, Philadelphia	2.50c
Shapes, New York	2.70c
Plates, Cleveland	2.85c
Plates, Philadelphia	2.75c
No. 10 blue anl. sheets, Chgo.	2.95c
No. 10 blue anl. sheets, Clevel'd	3.25c
No. 10 blue anl. sheets, Buffalo.	3.25c
No. 10 blue anl. sheets, St. Louis	3.00c
No. 10 blue anl. sheets, Cinci.	3.25c
No. 10 blue anl. sheets, St. Paul	3.05c
No. 28 black sheets, Chgo.	3.00c
No. 28 black sheets, Cleveland.	2.95c
No. 28 black sheets, Cincinnati.	3.00c
No. 28 black sheets, St. Louis.	3.20c
No. 28 black sheets, St. Paul.	3.25c
No. 28 galv. sheets, Chgo.	4.80c to 5.00c
No. 28 galv. sheets, Cleveland.	5.25c
No. 28 galv. sheets, Cincinnati.	5.25c
No. 28 galvanized sheets, St. L.	5.25c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Arch bars and transoms, Chgo.	$18.00 to 18.50
Arch bars and transoms, St. L.	18.00 to 18.50
Angle bars, iron, Chicago	17.25 to 17.75
Angle bars, steel, St. Louis	13.50 to 14.00
Arch bars and transoms, Chgo.	18.00 to 18.50
Arch bars and transoms, St. L.	16.50 to 17.00
Cut forge, Chicago	14.00 to 14.25
Knuckles, coup., Chgo	15.50 to 16.00
Springs	16.00 to 16.25
Knuckles, coup., St. L.	15.50 to 16.00
Locomotive tires, Chicago	16.00 to 16.50
Locomotive tires, St. Louis	15.00 to 15.50
Railroad wrought, No. 1, Chgo.	14.75 to 15.25
Railroad wrought, No. 1, Cleve.	18.00 to 18.50
Railroad wrought, No. 1, St. L.	14.50 to 15.00
Railroad wrought, No. 1, Cinci.	12.50 to 13.00
Railroad wrought, No. 2, Chgo.	14.00 to 14.25
Railroad wrought, No. 2, St. L.	14.50 to 15.00
Shafting, Chgo.	17.00 to 17.50
Shafting, St. Louis	17.00 to 17.50
Springs, Chgo.	16.25 to 16.50
Steel car ales, B'ham	14.50
Steel car axles, Chicago	21.75 to 22.25
Steel car ales, St. Louis	21.00 to 22.00
Pipes and flues, Chicago	10.75 to 11.25
Pipes and flues, Cleve'd (nom.)	13.00 to 13.75

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Boiler plate, cut, No. 1, Chgo.	11.50 to 12.00
Boiler plate, cut, No. 1, St. L.	7.00 to 7.50
Boiler punchings, Chicago	14.00 to 14.50
Busheling, No. 1, Chicago	11.75 to 12.25
Busheling, No. 1, Cleveland	14.00 to 14.50
Busheling, No. 1, Cincinnati	10.25 to 10.75
Busheling, No. 1, St. Louis	11.50 to 12.00
Busheling, No. 2, Chicago	8.75 to 9.25
No. 1 cast	13.00 to 13.50
Bundled sheet, Cincinnati	8.50 to 9.00
Cast, No. 1, Cleveland	14.25 to 14.75
Cast, No. 1, Cincinnati	11.50 to 12.00
Cast, No. 1, St. Louis	9.50 to 10.00
Cast borings, Chicago	7.25 to 7.75
Cast borings, Cleveland	8.50 to 8.75
Cast borings, Cincinnati	7.50 to 8.00
Cast borings, St. Louis	7.00 to 7.50
Machine shop turnings, Chgo.	8.00 to 8.50
Machine shop turnings, Cleveland	7.25 to 7.50
Machine shop turnings, Cinci.	7.00 to 7.50
Machine shop turnings, St. L.	8.00 to 8.50
Malleable agricultural, Chgo.	12.00 to 12.50
Malleable agriculture, St. Louis	10.50 to 11.00
Malleable railroad, Chicago	14.25 to 14.50
Malleable, Cincinnati	8.50 to 9.00
Malleable railroad, St. Louis	12.00 to 12.50
Pipes and flues, Chgo.	11.75 to 12.25
Pipes and flues, St. Louis	10.50 to 11.00
Stove plate, Chicago	11.00 to 11.50
Stove plate, Cleveland	10.25 to 10.75
Stove plate, Buffalo	9.50 to 10.00
Stove plate, Cincinnati	8.00 to 8.50
Stove plate, St. Louis	9.50 to 10.00

(Gross tons.)

Boiler plate sheared, Buffalo	13.00 to 13.50
Busheling, No. 1, Buffalo	13.50 to 14.00
Busheling, No. 1, Pbgh	14.50 to 15.00
Busheling, No. 2, Buffalo	11.00 to 11.50
Bundled sheet, Pittsburgh	14.50
Bundled sheet, Cleveland	12.75 to 13.25
Bundled sheet, Buffalo	12.00 to 12.50
Car wheels (iron), Pittsburgh	15.50 to 16.00
Car wheels (steel), Pittsburgh	18.00 to 18.50
Car wheels, Chicago	13.75 to 14.00
Car wheels, eastern Pa.	16.00 to 16.50
Car wheels, Buffalo	15.25 to 15.75
Car wheels, N. Y.	14.00 to 14.50
Car wheels, St. Louis	13.00 to 13.50
Cast borings, New York	9.00 to 9.25
Cast borings, eastern Pa.	11.50 to 12.00
Cast borings, Buffalo	9.25 to 9.75
Cast borings, Pittsburgh	11.25 to 11.50
Cast, No. 1, eastern Pa.	17.50 to 18.00
Cast, No. 1, Pittsburgh	16.00 to 16.25
Cast, heavy No. 1, N. J. points	16.50 to 17.00
Forge, No. 1, eastern Pa.	14.00 to 14.50
Frogs, switches, guards, Chgo.	15.00 to 15.50
Frogs, switches, guards, St. L.	15.25 to 15.75
Grate bars, Buffalo	11.00 to 11.50
Grate bars, N. J. points	13.25 to 13.50
Heavy axle turnings, Buffalo	12.00 to 12.50
Heavy melting steel, Pbgh	17.50 to 18.00
Heavy melting steel, Buffalo	16.50 to 17.00
Heavy melting steel, Chicago	15.00 to 15.50
Heavy melting steel, Cleveland	16.25 to 16.75
Heavy melting steel, Cincinnati	13.75 to 14.25
Heavy melting steel, eastern Pa.	16.50 to 17.00
Heavy melting steel, New York	14.25 to 14.50
Heavy melting steel, St. Louis	15.25 to 15.75
Iron rails, Chicago	17.00 to 17.50
Iron rails, Buffalo	17.00 to 17.50
Iron rails, Cincinnati	14.00 to 14.50
Iron rails, St. Louis	16.00 to 16.50
Iron rails, Cleveland (nom.)	17.00 to 18.00
Iron axles, Pittsburgh	25.00 to 26.00
Iron axles, Cincinnati	20.25 to 20.75
Iron axles, eastern Pa.	26.00 to 27.00
Iron axles, Chgo.	24.00 to 24.50
Iron axles, Buffalo	23.00 to 23.50
Iron axles, St. Louis	22.25 to 22.50
Low phos. steel, Buffalo	20.50 to 21.00
Low phosphorus steel, Pbgh	21.50 to 22.00
Low phos. steel, eastern Pa.	22.00 to 23.00
Machine shop turnings, Buffalo	7.75 to 8.25
Mch. shop turnings, New York	8.00 to 8.50
Mch. shop turnings, Pbgh	9.25 to 9.75
Mch. shop turnings, eastern Pa.	10.75 to 11.00
Mall. railroad, Cleveland	16.25 to 16.50
Malleable railroad, Pittsburgh	16.25 to 16.50
Malleable railroad, Buffalo	15.25 to 15.75
Malleable railroad, eastern Pa.	14.50 to 15.00
R. R. and mch. cast, No. 1, Bfl.	15.25 to 15.75
R. R. wrought, No. 1, Buffalo	17.50 to 18.00
Railroad wrought, No. 1, E. Pa.	22.00 to 23.00
R. R. wght., No. 1, New York	20.50 to 21.00
Railroad wrought, No. 1, Pbgh.	19.00
Reroll. rails, 5 ft. & ov., Pbgh.	18.00 to 18.50
Reroll. rails, 5 ft. & ov., Chgo.	17.00 to 17.50
Reroll. rails, 5 ft. & ov., Cleve.	16.25 to 16.75
Reroll. rails, 5 ft. & ov., E. Pa.	19.00 to 20.00
Reroll. rails, 5 ft. & ov., St. L.	17.50 to 18.00
Shafting, New York	19.00 to 19.50
Shafting, eastern Pa.	23.00 to 23.50
Shoveling steel, Chicago	14.75 to 15.00
Shoveling steel, St. Louis	14.00 to 14.50
Steel rails, short, Chicago	16.50 to 17.00
Steel rails, short, Cleveland	18.25 to 18.50
Steel rails, short, St. Louis	15.25 to 15.75
Steel car axles, New York	22.00 to 23.00
Steel car axles, Buffalo	23.00 to 23.50
Steel car axles, Cleveland	24.00 to 24.50
Steel car axles, eastern Pa.	24.00 to 25.00
Stove plate, N. J. points	13.25 to 13.50
Stove plate, Pittsburgh	11.50 to 12.00
Stove plate, eastern Pa.	12.50 to 13.00
Wrought pipe, New York	13.25 to 13.50
Wrought pipe, Buffalo	13.00 to 13.50
Wrought pipe, eastern Pa.	15.25 to 15.75

Opportunities

POSITIONS OFFERED

Minimum ad. set solid, 50 words $1.00
Minimum ad. all caps, 50 words $1.50

POSITIONS WANTED

Minimum ad. set sold, 25 words $.50
Minimum ad. all caps, 25 words $.75

(Each additional word set solid, 2c.—Each additional word all caps, 3c.)

Positions Offered

WANTED AT ONCE, SEVERAL FIRST class draftsmen of general mill and blast furnace experience. State age, experience, present salary and salary wanted in first letter; also when available. Central location Pittsburgh. Address Box 749, THE IRON TRADE REVIEW, Cleveland, O.

WANTED AT ONCE, SEVERAL DRAFTSmen experienced in power plant and general piping work. State experience, present salary and salary wanted in first letter; also when available. Central location Pittsburgh. Address Box 750, THE IRON TRADE REVIEW, Cleveland, O.

UNDERSIGNED COUNSEL WILL CONfidentially negotiate preliminaries for important executive, technical, administrative and professional positions, insuring strictest privacy. Not an agency, but a highly-endorsed, high grade method of negotiating preliminaries only, for $2,000 to $12,000 men. Send address only for explanation. R. W. Bixby, F1 Niagara Square, Buffalo, N. Y.

WE WANT TO GET IN TOUCH WITH a first class steel salesman. Our output is electric alloy steel in ingots, billets and bars.

A record of actual sales in this specialty and a good personal acquaintance with its uses and users is essential. Replies must give sufficient particulars along the above lines, including references. Confidential handling is assured; references will not be approached until after definite agreement.

Address Box 771,
THE IRON TRADE REVIEW, Cleveland, O.

THE BEST WAY TO GET A GOOD position in drafting or engineering is to file an application direct with some of our clients who are depending on us to get competent and experienced applicants for their vacant positions. Send stamp for blank and list of vacant positions. The Cleveland Engineering Agency Co., Rose building, Cleveland, O.

WANTED:—A MAN CAPABLE OF ACTing as general foreman for a steel foundry making high grade small castings principally for the automobile trade. In reply give detailed information. All answers will be kept strictly confidential. The insertion of this ad is known to all of our present foremen. Address Box 759, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — NIGHT FOREMAN FOR Steel Foundry in Detroit. One who is familiar with Railroad work preferred. Address Box 761, THE IRON TRADE REVIEW, Cleveland, O.

Positions Offered

WANTED: — THOROUGHLY EXPErienced man to take charge of chipping shop in converter steel plant. Address Box 772, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—EXPERIENCED RATE SETter cleaning steel castings Pneumatic Hammer operations, such as removing sand and fins, grinding, saw, operations, and the like. Give experience, references and salary expected. Address Box 775, THE IRON TRADE REVIEW, Cleveland, O.

WANTED AT ONCE—SEVERAL FIRST-class Mechanical draftsmen, checkers and designers of not less than five years experience. Location Pittsburgh district, steel mill in town of 12,000 population. Good salaries to competent men. Give experience in detail, age, nationality, salary expected and earliest date that you could report. Address Box 777, THE IRON TRADE REVIEW, Cleveland.

Positions Wanted

SUCCESSFUL EQUIPMENT SALESMAN would like to communicate with manufacturers desiring first class representation in Pittsburgh district. Best of references. Salary on commission. Address Box 751, THE IRON TRADE REVIEW, Cleveland, O.

BLAST FURNACE SUPERINTENDENT, competent, successful and up-to-date in furnace practice. For 10 years making Bessemer iron. Now employed at a record breaking plant making basic iron. Wishes position with a company appreciating good work. Can refer you to past and present employer. Address Box 755, THE IRON TRADE REVIEW, Cleveland, O.

BY MAN WITH THOROUGH KNOWLEDGE OF FOUNDRY BUSINESS, HIGH EXECUTIVE ABILITY AND CHARACTER WITH UNSURPASSED REFERENCES. FIFTEEN YEARS IN AN OFFICIAL CAPACITY; SEEKS POSITION AS SUPERINTENDENT OR WORKS MANAGER WITH THOROUGHLY RELIABLE CONCERN. ADDRESS BOX 756, THE IRON TRADE REVIEW, CLEVELAND, O.

Jot down

the ad you want to insert for that Position and send it along so that we receive it

Monday

Positions Wanted

COMPETENT BLAST FURNACE SUPERintendent, technically trained; twelve years experience in modern and efficient practice, management and operation with large plant. Thoroughly understand ores, amount of temperature, blast and material required to produce different kinds of iron. Well versed in modern practice. Desire change; investigate my record. Address Box 764, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED. BY BLAST FURnace superintendent. Twenty years experience in the iron business. Good references. Address Box 728, THE IRON TRADE REVIEW, Cleveland, O.

WHEN YOU NEED A HIGH GRADE executive, engineer, draftsman, or any technical man, consult The Engineering Agency, Inc., (Est. 21 years) 1662 Monadnock Block, Chicago.

AS FOUNDRY SUPERINTENDENT OR manager; graduate in metallurgy and mix by analysis; have wide experience on loams dry and green sand in brass, bronze, steel and iron; expert on molding machines and metal plates, estimating; wood and metal pattern-making; spent 5 years as chief foundry engineer and adviser in U. S. navy yard; age 37, married; can furnish highest references. Address Box 767, THE IRON TRADE REVIEW, Cleveland, O.

AS BAR OR GUIDE ROLLER; OPEN for position either iron or steel; bar mill preferred; can furnish first-class references. Strictly temperate and a hustler. Address Box 773, THE IRON TRADE REVIEW, Cleveland, O.

AS BLAST FURNACE SUPERINTENDent or Assistant, up-to-date man; at present employed with large concern. Age 33 years; 10 years experience Merchant and mill irons smelting all grades of ores. Technical graduate; undeniable references regarding ability, etc., from successful furnacemen. Practical from the keeper up. Location no object. Address Box 774, THE IRON TRADE REVIEW, Cleveland, O.

AS GENERAL FOUNDRY FOREMAN; 30 years wide experience in steam and gas engines; tool machinery and architectural iron castings; up-to-date in all foundry practice; thoroughly experienced in loam, dry and green sand work; perfect in core work; wants to locate with large concern west of Chicago; open shop preferred. A-1 references. Address Box 738, THE IRON TRADE REVIEW, Cleveland, O.

POSITION AS BLOWER OR IRON Foreman by a blast furnaceman of good education and wide experience. Excellent references. Address Box 763, THE IRON TRADE REVIEW, Cleveland, O.

YOUNG MAN DESIRES POSITION IN steel trade, willing to go into mill, with opportunity to get into sales department. Have had three years experience in forging business, two years as assistant to superintendent of forge shops. Can furnish best of references. Address Box 762, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: POSITION BY MECHANICAL ENGINEER. Eighteen years' experience as die sinker and master mechanic. Address Box 716, THE IRON TRADE REVIEW, Cleveland, Ohio.